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Rethinking How the Air Force Views Sustainment Surge

Cynthia R. Cook, John A. Ausink, Charles Robert Roll, Jr.

Prepared for the United States Air Force

PROJECT AIR FORCE

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Preface

This report summarizes the RAND Corporation's analysis of surge planning and how the Air Force might reconsider how it views surges in production requirements at its depots in response to the demands of large-scale contingency operations and other major operations. This task is part of a project entitled "Sustainment Surge Capacity," sponsored by Mr. Nelson F. Gibbs, Assistant Secretary of the Air Force for Installations, Environment and Logistics (SAF/IE), and Lt Gen Michael E. Zettler, Deputy Chief of Staff of the Air Force for Installations and Logistics (AF/IL), and was conducted within the Resource Management Program of RAND Project AIR FORCE.

This research should be of interest to military and civilian professionals involved in issues related to the management of Air Force air logistics centers, the transformation of surge operations, and Air Force planning for surge operations. For additional information, please contact the Resource Management Program director, Dr. C. Robert Roll, at bob_roll@rand.org.

For the last decade, RAND Project AIR FORCE has been helping the Air Force reshape its sourcing policies and practices. The reader may also be interested in the following related RAND reports:

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- *How Should the U.S. Air Force Depot Maintenance Activity Group Be Funded? Insights from Expenditure and Flying Hour Data*, MR-1487-AF, 2002
- *Implementing Best Purchasing and Supply Management Practices: Lessons from Innovative Commercial Firms*, DB-334-AF, 2002
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- *Strategic Sourcing: Measuring and Managing Performance*, DB-287-AF, 2000
- *Lean Logistics: High-Velocity Logistics Infrastructure and the C-5 Galaxy*, MR-581-AF, 1999
- *Aging Aircraft: Implications for Programmed Depot Maintenance and Engine-Supported Costs*, CT-149, 1999
- *Transfer Pricing for Air Force Depot-Level Reparables*, MR-808-AF, 1998
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- *Central Stock Leveling: Evaluations of Alternative Approaches*, RB-28, 1995.

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Summary

Each of the military services, including the Air Force, faces the challenge of keeping its weapon systems in good repair so that they are ready to be used in battle during wartime and for training in times of peace. Sustainment,[1] or repair and maintenance, is an ongoing requirement to be planned for and managed. There are variations in the level of support required to fix weapon systems, generally based on how heavily the systems are used. "Sustainment surge" describes the increase in the requirement to repair weapon systems and components during the increased operational demands of wartime or contingency operations.[2] "Core" capabilities are loosely understood to be skills that should be retained by government employees in government-owned facilities so that they are prepared to respond to surge requirements. Planning for surge is an ongoing activity that the Air Force and the other services need to have in place. (See pages 1–2.)

The threat environment faced by the United States, which drives sustainment surge planning, changes over time. At the end of the Cold War, military planning was based on the idea that the United States should be able to fight two simultaneous major theater wars. In 2002, the Department of Defense (DoD) decided that a new

[1] Describing the broad scope of the Air Force's sustainment processes is beyond the scope of this report. The RAND reports referred to in the Preface provide insight into the topic.

[2] A surge may also be caused by an unexpected technical flaw that requires every unit of a weapon system be repaired.

force-planning construct should instead provide for (1) deterrence in four critical theaters, backed by the ability to (2) swiftly defeat two aggressors in the same time frame, while (3) preserving the option for one massive offensive to occupy an aggressor's capital and replace the regime and (4) having the ability to execute several lesser contingencies. A more recent shift in discussions of the security environment highlights four security challenges: "traditional" challenges from states employing legacy and advanced military capabilities and recognizable military forces in known forms of conflict, thus challenging our power; "irregular" challenges from unconventional methods adopted by non-state actors to counter stronger state opponents, they eroding our power; "disruptive" challenges from international competitors that develop breakthrough technological capabilities to supplant U.S. advantages, thus marginalizing our power; and "catastrophic" challenges from terrorists and rogue states that use weapons of mass destruction (WMD) or WMD-like effects, thus paralyzing our power.[3] (See pages 3–4.)

In this research, we examine whether changes in the security environment and in the nature of conflicts for which the Air Force prepares are adequately reflected in the planning and execution of sustainment surge operations. We look at three major issues:

- How has the demand for sustainment surge changed? Are the concepts of core and surge outdated?
- Has legislation hindered Air Force management in developing effective and efficient ways to manage surge?
- How can the effectiveness and efficiency of surge planning be improved in the future? Are changes needed in planning, contract management, or data collection?

This report addresses all three questions, using quantitative sustainment data from depots and information obtained from interviews with depot personnel.

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[3] See Arthur Cebrowski, Director, Office of Force Transformation, "Transforming Transformation," *Transformation Trends*, April 19, 2004.

What have we found? The available data on depot production and overtime since 1991 indicate that the nature of surge has indeed changed. Instead of the large increases expected in the Cold War model (which would lead to double and triple overtime situations), data covering operations from Desert Storm to Enduring Freedom and Iraqi Freedom show relatively modest changes in production and overtime. Some of those we interviewed argued that depots must still plan for a large-scale surge that would require greater increases in production than are observed in the data; however, the satisfactory depot responses to recent major contingencies, combined with a large and largely untapped commercial production capacity, indicate to us that sizing depots for a Cold War–type surge is not necessary—especially if contractors are better integrated into surge planning. The Cold War–era concept of surge does not reflect the current challenges that the Air Force must face, and it does not incorporate the new reality, in which surge represents "business as usual." The depots are managing to deal with variation in requirements without large increases in employment or even in overtime. (See pages 27–28.)

A review of the legislative history (and of DoD responses) related to military depot operations reveals that while there has been much concern about retaining certain "core" functions in government facilities, there has also been an ongoing discussion about just what those core functions might be. In addition, while the retention of core functions in government is meant to ensure an adequate response to the production demands of surge operations, there is apparently no congressional requirement that all work related to surge operations be performed by government personnel. This fact is important, because many managers in Air Force depots assume that the requirement exists. Over time, legislative restrictions on the amount of depot work that can be contracted out has added to some of the confusion about what constitutes "core" and who is allowed to accomplish the increased workloads in surge situations. Legislation may not have directly hindered depot management in developing effective and efficient ways to manage surge, but misunderstandings about the language may limit their willingness to explore all the legal options for surge planning. Furthermore, the concept of "core" is suf-

ficiently fuzzy that the term itself could be discarded. This would not mean that the congressionally imposed limit on outsourced sustainment need change or even that the various justifications that have been offered in its defense are not important, but rather that the maintenance of some level of internal capacity be simply viewed as a "just-in-case" defense resource. (See page 23.)

Any lack of clarity in the legislation has not meant that Headquarters has doubts about incorporating contractors in surge planning. In fact, we found strong support for this approach. However, our interviews at the depots found that there was real concern about the downsides of formally incorporating surge clauses into contracts. Depot personnel indicated that adding these types of clauses generally increased total contract costs and that it was usually possible to accelerate work without formal agreement. While the acceleration would come at a price, the price was paid only if the work was actually needed. In addition to concerns about costs, there was a lack of confidence in contractor responsiveness in the event of surge, even if surge provisions exist in the contract. These concerns and other issues aired during our interviews suggest that contractors are not seen as true partners in the surge process, nor are they seen as good candidates for such a partnership. However, little or no data in support of these views were provided. Contractors can be used during surge and should be incorporated into future planning. (See pages 47–49.)

Air Force depot structure and management practices changed significantly in the early to mid-1990s. Depot consolidation included the closing of significant depot facilities—at Kelly Air Force Base in San Antonio, Texas, and McClellan Air Force Base in Sacramento, California—leaving the three depots that exist today. Management changes, such as two-level maintenance and lean logistics, were implemented at roughly the same time. New data systems were put in place, and the Air Force made further efforts to improve depot operations. However, individual depots introduced some approaches (including data systems) independently, and information across depots is not usually directly comparable. A formal, top-level approach to data systems and overall knowledge management could contribute to more standardization among depots. (See pages 53–54.)

Also in the 1990s, optimization algorithms were developed to improve the prioritization of spare parts allocation. The computer model and management system called EXPRESS (Execution and Prioritization of Repair Support System) was fully implemented by 1995 and is used today to set priorities for depot repair of spare parts. While this system has been useful in managing some surge requirements, there are critical assets for which EXPRESS is not applicable, and ensuring the availability of these assets requires other approaches to surge planning. (See pages 6–7.)

Surge has become part of regular ongoing depot activity instead of an unusual event. Furthermore, recent contingencies in which there have been increases in flying hours have not led to overwhelming increases in depot repair. Depot work is not necessarily linked to actual demand at a fixed point in time; appropriate planning can help the depots proactively prepare for expected conflicts. For example, the Logistics Support Analysis conducted during the lead-up to Operation Iraqi Freedom showed that when the surge order was issued, the depots had already taken steps in anticipation of the order. The Air Force should incorporate a variety of initiatives as it develops an approach that recognizes that surge is part of normal operations—both in execution and in planning. These include continual metric development and assessment, benchmarking internal operations with those of contractors, improving (and in some cases centralizing) data systems, and incorporating contractors into the surge planning process.

We recommend that the Air Force develop better knowledge management that could be used in support of surge planning and operations. Air Force leadership should be able to use it to gain insight into how production is organized and managed, including information on capacities and abilities of both facilities and human capital, and into how contractors are linked into this process. They should consider what metrics would be most useful and should design the data systems to accurately and quickly collect the data that would support those metrics. This will require a centralized discussion engaging all three depots, Headquarters Air Force Materiel Command, and the office of the Assistant Secretary of the Air Force for

Installations, Environment and Logistics (SAF/IE). (See pages 68–69.)

Finally, we recommend that the Air Force develop centralized guidance on how to manage contractors as a potential surge asset. We have found no reason why contractors cannot be used in this way and furthermore have found local examples where they have been efficiently used for surge. But there is no clear policy on how to incorporate contractors, and the depots each take a different approach, from trying to avoid their use to seeing them as a source of flexibility for surge. The push for clear policy needs to come from Headquarters, at a level above the depots themselves. (See page 69.)

Any centralization must take into account the different cultures at the depots. They may be slower or faster to adopt changes and may require more or less training. Incorporating the perspectives of the three depots during the process of planning for change improves the likelihood that the end result will be a usable plan.

Acknowledgments

We are grateful for the assistance of many individuals within the Air Force who provided background information, data, and insights from their personal experiences with depot management in general and surge procedures in particular.

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We would like to thank RAND colleagues Kathi Webb and Irv Blickstein for their thoughtful critiques of this report. Our research assistant, Michele Anandappa, also made a substantial contribution to this project.

The authors of this report are responsible for any errors in interpretation of the original data.

Abbreviations

AFMC	Air Force Materiel Command
ALC	air logistics center
APS	Advanced Planning and Scheduling
BOA	Board of Advisors
BRAC	Base Realignment and Closure
CJCSI	Chairman of the Joint Chiefs of Staff Instruction
DoD	Department of Defense
DMAG	Depot Maintenance Activities Group
DMRT	Depot Maintenance Reengineering and Transformation
DO-CAT	depot-operated contractor augmentee team
DRC	Dynamics Research Corporation
DRIVE	Distribution and Repair in Variable Environments
EMSS	EXPRESS MAJCOM Scenario Subsystem
EPM	EXPRESS Planning Module
EXPRESS	Execution and Prioritization of Repair Support System
GAO	General Accounting Office (now the Government Accountability Office)
JCS	Joint Chiefs of Staff
MAB	Oklahoma City aircraft division

MC	mission capable
MCO	major combat operation
MICAP	mission incapable
M&R	maintenance and repair
OEF	Operation Enduring Freedom
OIF	Operation Iraqi Freedom
Oplan	Operation Plan
PIP	privatization-in-place
PSCM	purchasing and supply chain management
RSP	Readiness Spares Package
SAF/IE	Assistant Secretary of the Air Force for Installations, Environment and Logistics
SOR	source of repair
SOS	source of supply
WCF	working capital fund
WMD	weapons of mass destruction
U.S.C.	United States Code
USCENTAF	United States Central Command Air Forces
YTD	year-to-date

CHAPTER ONE

Introduction

Air Force Depot Maintenance

Each of the military services, including the Air Force, faces the challenge of keeping its weapon systems in good repair so that they are ready to be used in battle during wartime and for training in times of peace. Sustainment, or repair and maintenance, is an ongoing requirement to be planned for and managed. There are variations in the level of support required to fix weapon systems, generally based on how heavily the systems are used—and they are more heavily used during war. "Sustainment surge" describes the increase in the requirement to repair weapon systems and components during the increased operational demands of wartime or contingency operations.[1] Preparing for surge is an ongoing activity for which the Air Force and the other military services need to have a plan in place. As we will describe, the threat environment faced by the United States, which drives sustainment surge planning, has changed over time, and the nature of surge has changed as well.

Considerable thought and effort go into having sufficient surge capability available. In particular, surge has also been the subject of legislation passed by Congress, which has been concerned about the country being adequately prepared for war. Congress requires the services to maintain "core" depot capabilities, which are loosely understood to be skills or management expertise that should be

[1] A surge may also be caused by an unexpected technical flaw that requires every unit of a weapon system to be repaired.

retained by government employees in government-owned facilities so that they are prepared to respond to the surge requirements that arise in wartime. In the Air Force, the primary repair depots currently in operation are the three air logistics centers (ALCs) at Robins Air Force Base, Georgia (Warner Robins Air Logistics Center); Tinker Air Force Base, Oklahoma (Oklahoma City Air Logistics Center); and Hill Air Force Base, Utah (Ogden Air Logistics Center).[2]

Depots engage in a wide variety of activities geared toward sustaining and repairing weapon systems, and aircraft and their components require regular servicing. A RAND Corporation report from the early 1980s[3] lists five major categories of depot maintenance:

- Airframe rework—refers to work on the complete aircraft, including inspection and repair of airframe structural components to correct the effects of corrosion and/or fatigue and modification kit installation, but not individual components that can be removed and replaced.
- Engine overhaul—occurs periodically and includes disassembling engines, inspecting and replacing worn components, and reassembling the engine with new or rebuilt parts.
- Airframe component repair—includes inspection and repair of various airframe components, including landing gear, tail hooks, hydraulic actuators, and small aerodynamic surfaces, including flaps and slats.
- Engine component and accessory repair—refers to the repair of engine components and accessories.

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[2] These centers are also known by their respective acronyms: WR-ALC, OC-ALC, and OO-ALC. Throughout this report, we refer to them simply as Warner Robins, Oklahoma City, and Ogden.

[3] Kenneth E. Marks and Ronald W. Hess, *Estimating Aircraft Depot Maintenance Costs*, Santa Monica, Calif.: RAND Corporation, R-2731-PA&E, 1981. This research was described and expanded upon in Cynthia R. Cook, Mark V. Arena, John C. Graser, Hans Pung, Jerry Sollinger, and Obaid Younossi, *Assembling and Supporting the Joint Strike Fighter in the UK: Issues and Costs*, Santa Monica, Calif.: RAND Corporation, MR-1771-MOD, 2003.

- Avionics component repair—includes repair of the components of the cockpit displays, radar, communications, navigation, identification, electronic warfare systems, and other related line replaceable units.

Each of the three Air Force depots has particular maintenance tasks for particular types of aircraft. Ogden has a specialized landing gear shop, for example, while Oklahoma City repairs many types of engines. There is some overlap, but each ALC is mostly specialized.

During a contingency, most surge activity for the depots consists of an increase in the number of various spares and components repaired rather than increasing the rate of whole airframe rework, which is much less common. Airframe rework surge takes two forms: *compression*, which involves doing only what is absolutely necessary to get the aircraft back to basic operational readiness, and *acceleration*, which involves finishing the planned maintenance tasks more quickly.

Surge planning should be driven by threat scenarios. In 2002, the Department of Defense (DoD) decided that post–Cold War force planning should provide for (1) deterrence in four critical theaters, backed by the ability to (2) swiftly defeat two aggressors in the same time frame, while (3) preserving the option for one massive offensive to occupy an aggressor's capital and replace the regime and (4) having the ability to execute several lesser contingencies.[4] A more recent shift in discussions of the security environment highlights four security challenges: "traditional" challenges from states employing legacy and advanced military capabilities and recognizable military forces in known forms of conflict, thus challenging our power; "irregular" challenges from unconventional methods adopted by non-state actors to counter stronger state opponents, thus eroding our power; "disruptive" challenges from international competitors that develop breakthrough technological capabilities to supplant U.S. advantages, thus marginalizing our power; "catastrophic" challenges from terrorists

[4] This guidance replaced one that called for the ability to respond to two major theater wars.

and rogue states that use weapons of mass destruction (WMD) or WMD-like effects, thus paralyzing our power.[5] These changes in the security environment and in the nature of the combat that the Air Force prepares for and engages in suggest that the planning and execution of surge could usefully be examined to ensure it is appropriately structured to meet current and future challenges. This leads us to ask: How can surge be better planned for and executed in the environment the Air Force faces today, and is likely to face in the future? Before we turn to those questions, we present a brief history of how Air Force maintenance has changed over time.

Transformation of Air Force Maintenance

The current depot management structure is the end result of efforts to improve operations over the years. There used to be five major Air Force depots. Through the end of the 1980s, the overarching Cold War management philosophy driving operations was the storage of a large supply of spare parts in preparation for a war of attrition with the Soviet Union.

Major changes in the early to mid-1990s had significant implications for the depots. The Air Force depot structure underwent a consolidation that included closing significant depot facilities at Kelly and McClellan Air Force bases, thus leaving the three depots that exist today. Two related management changes, two-level maintenance and lean logistics, were implemented at roughly the same time. New data systems were put in place, and the Air Force made further efforts to improve depot operations.

Two-level maintenance is a "remove and replace" maintenance philosophy that was originally applied to F-16 avionics and later extended to other maintenance needs. Under this approach, "exchangeables" are removed from the aircraft on the flight line and replaced with working items. The broken items are sent back to the

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[5] See Arthur Cebrowski, Director, Office of Force Transformation, "Transforming Transformation," *Transformation Trends*, April 19, 2004.

depots, where they are repaired. (This is in contrast to the three-level maintenance approach, under which some repair work takes place in back shops on the base, with the rest occurring at the depots. Three-level maintenance is still in operation for some legacy weapon systems.) Lean logistics involves a reduction of inventories at the base and at the depot and requires a tighter coupling of repair at the depot and requirements at the flight line, made possible by the ability to get the repaired item to the right place very quickly. This "just-in-time" approach to depot-level repair is needed for two-level maintenance to be successful.

By reducing pipelines and transportation time and coupling depot repair more closely to flight line needs, the Air Force could respond to uncertainties with greater flexibility by being able to change repair priorities and deliver goods more quickly. Prior to that, supply policy had put a very heavy reliance on large stocks of spare parts. So the change in policy to two-level maintenance meant not only increased responsiveness but also considerable reduction in (or "leaning" of) the stock of spare parts, especially if given better information systems to ensure needs were communicated quickly. These changes allow the repair process to be more responsive in contingencies and thus require less of an excess depot capacity to be able to build up large stocks for contingency support. The Air Force was able to substitute transportation and information for large stocks of spare parts.

At about the same time, optimization algorithms to improve the use of scarce spare parts to increase aircraft availability began to be implemented. In 1992, RAND and Ogden Air Logistics Center developed and demonstrated the DRIVE (Distribution and Repair in Variable Environments) system as a prototype.[6] This system was the kernel of an approach to prioritize repairs to achieve better worldwide

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[6] See John B. Abell, L. W. Miller, Curtis E. Neumann, and Judith E. Payne, *DRIVE (Distribution and Repair in Variable Environments): Enhancing the Responsiveness of Depot Repair*, Santa Monica, Calif.: RAND Corporation, R-3888-AF, 1992, and Louis W. Miller and John B. Abell, *DRIVE (Distribution and Repair in Variable Environments): Design and Operation of the Ogden Prototype*, Santa Monica, Calif.: RAND Corporation, R-4158-AF, 1992.

aircraft availability goals. This approach was then embedded in a computer model and management system called EXPRESS (Execution and Prioritization of Repair Support System), fully implemented by 1995.[7] EXPRESS is in use today to set priorities for depot repair of spare parts.

EXPRESS has been adapted to be used in support of surge through the incorporation of Joint Chiefs of Staff (JCS) project codes. JCS project codes identify specific repair items that are viewed as critical in any war effort and therefore take formal priority in the repair queue.[8] In August 1997, the Air Force Logistics Board of Advi-

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[7] Dynamics Research Corporation (DRC) developed EXPRESS and describes the system in the following way:

> DRC developed an automated system called EXPRESS to direct the daily execution and distribution of component repair. EXPRESS, a system that interfaces with essential Air Force legacy systems helps guide depot managers in reaching their goals for optimizing aircraft availability in a resource-constrained environment. For example, the Working Level and Base Needs Report generated by EXPRESS displays wholesale and retail information for a particular National Stock Number item including the asset status at the depot repair center; the asset status at the operating bases; base authorization levels; depot working level replenishment needs; operating base replenishment needs; and the number of repairs required to satisfy depot and base needs.

The EXPRESS System

- Provides information for daily execution decisions for repair and distribution of reparable items.
- Resolves resource constraints.
- Allows the Air Force Materiel Command (AFMC) to proactively identify and resolve bottlenecks before they occur.
- Enables the AFMC to set priorities in accordance with operational aircraft availability goals and successfully manage to those priorities.
- Delivers a major component of the Air Force's Lean Logistics Program.

Dynamics Research Corporation, "Execution and Prioritization of Repair Support System (EXPRESS)," December 1, 2004.

[8] The Joint Materiel Priorities and Allocation Board is charged by the Chairman of the Joint Chiefs of Staff with establishing materiel priorities and allocating resources. Membership and responsibilities of the board are described in Chairman of the Joint Chiefs of Staff Instruction (CJCSI) 4120.01B, Uniform Materiel Movement and Issue Priority System: CJCS Project Codes and Materiel Allocation Policies During Crisis and War, May 30, 2003. Responsibilities include the promulgation of "CJCS project codes as required in the context of deliberate and crisis planning as part of logistics guidance contained in CJCS Execute Orders and other suitable tasking directives." CJCS project codes provide precedence for requisition

sors (BOA)[9] directed Air Force Materiel Command (AFMC) officials to have EXPRESS provide a synchronized repair and distribution list. As a result, the logic of the EXPRESS model that prioritized both repair execution and distribution of serviceable assets was modified to provide nine categories of prioritization. Back-ordered mission-incapable (MICAP) items with a JCS project code received the highest priority. The main difference between the earlier EXPRESS release sequence and the BOA release sequence was that the BOA sequence inserted a categorical priority ahead of the EXPRESS priority list. EXPRESS calculations reflected either the improvement in the probability of achieving specific aircraft availability targets or improvements in support based on filling the greatest back order or shortage in a requisitioning objective. Officials implemented the BOA release sequence throughout AFMC on May 15, 1998. As a result, for all contingencies, the JCS project code repair items have had the highest priority, overriding the EXPRESS priority sequence. However, once the high-priority category items are repaired, the release sequence follows the original EXPRESS logic.

These management changes increasingly accommodated the ability of the depots to be more closely linked to contingency operations, but a few limitations still remain. Although JCS project codes are meant to identify "a project, operation, program, force, or activity sanctioned by the Chairman that requires heightened logistic infrastructure visibility and support,"[10] priority levels have the potential to inaccurately reflect what the depots should focus their efforts on. For example, strategic airlift and tankers are critical assets to early

processing and supply decisions. For processing purposes, requisitions with a CJCS project code will be ranked above all other requisitions with the same priority designator.

[9] The BOA, an executive group of senior logistics officers chaired by the Air Force Deputy Chief of Staff for Logistics, gave guidance to the logistics community on a variety of issues. In 2001, the "IL/LG Meeting" replaced the BOA. The meeting plays a similar role but is limited to principals on the AF/IL staff and from logistics staff of the major commands. Frank Camm and Leslie Lewis, *Effective Treatment of Logistics Resource Issues in the Air Force Planning, Programming, and Budgeting System (PPBS) Process*, Santa Monica, Calif.: RAND Corporation, MR-1611-AF, 2003.

[10] CJCSI 4120.01B (2003), Enclosure A, paragraph 2c.

deployment operations but do not get JCS project code priority.[11] However, individual depots can surge items that do not have JCS project codes. Personnel at one depot indicated that they prioritized repairs critical for airlift aircraft for Operation Enduring Freedom (OEF) and Operation Iraqi Freedom (OIF) even in the absence of a JCS project code—so there appears to be some flexibility. Also, as a unit is close to redeploying back to the continental United States, its priority overstates its needs for the succeeding few days. Furthermore, likely new contingency operations should get planning priority but may not. With the depots focused on responding to the JCS project codes, their surge requirements have been manageable. (As a result, there has been little incentive to change surge planning.)

The Spares Campaign (initiated in early 2001) and the Depot Maintenance Review Team (launched shortly thereafter) were intended to improve spare parts planning, programming, and management to increase warfighting capabilities.[12] These programs, later aggregated into Depot Maintenance Reengineering and Transformation (DMRT), serve as important steps forward and can assist in surge planning and execution. It is noteworthy that the Depot Maintenance Master Plan, written in the summer of 2002, demonstrates forward thinking in terms of improving the organization as a whole; however, the plan barely touches upon surge, except for the question of financing it.

This brief history shows that maintenance philosophy and management tools for surging aircraft and aircraft parts repair have changed since the end of the Cold War. However, the concerns about maintaining a core capability have not changed, nor has the legislation that 50 percent of repair be conducted in-house as a basis for wartime surge.

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[11] As explained by personnel at Warner Robins.

[12] Both the Spares Campaign and related DMRT activities are described in the *Air Force Journal of Logistics*, Vol. 26, No. 3, Fall 2002. The entire issue is devoted to discussion of these initiatives.

Questions About "Core" and "Surge"

In January 2003, the Assistant Secretary of the Air Force for Installations, Environment and Logistics (SAF/IE), Mr. Nelson Gibbs, asked RAND to address three questions about the issue of sustainment surge:

- What are the principles underlying the development of the concepts of "core" and "surge" sustainment?
- What is the history of the legislation that affects how the Air Force manages surge operations?
- What alternatives does the Air Force have for the future management of surge?

Underlying these questions are three additional questions that affect how Air Force depots manage surge:

- How (if at all) has the demand for sustainment surge changed? Are the concepts of core and surge outdated?
- Has legislation hindered Air Force management in developing effective and efficient ways to manage surge?
- How can the effectiveness and efficiency of surge planning be improved in the future? Are changes needed in planning, contract management, or data collection?

Research Approach

RAND has undertaken significant work on logistics for the Air Force for decades. This work includes research in support of the Spares Campaign and the DMRT, Agile Combat Support, Combat Support Command and Control, Supply Chain Management, Spare Parts Supply Modeling (DRIVE and EXPRESS), Aging Aircraft, and many other issues relevant to depot management and organization. This research experience informed us in the development of three hypotheses relevant to the initial questions.

First, we suspected that the nature of surge has indeed changed over time. During the Cold War, surge planning assumed the necessity of large increases in production should war occur. Depots were sized to fulfill the Air Force's sustainment needs with one shift, leaving the second and third shift free in case of wartime emergency.[13] Transportation pipelines were long and vulnerable to disruption, and therefore mass production and distribution were clearly keys to victory in repairing the attrition of a global war with the Soviet Union. However, since the dissolution of the Eastern bloc, changes in the global security environment have led the United States to become involved in multiple, relatively small-scale contingencies. These contingencies have caused increases in sustainment requirements, but nothing like the scale of increase that was expected in the Cold War model.

Second, there was anecdotal evidence that, in part because of the interpretation of legislation[14] related to depot management, contractors are not well integrated into surge planning. Although there is no legal requirement that surge activities be conducted in-house, some have interpreted the legislation to mean this. While there have been attempts to improve the management of contractors at the ALCs—for example, as in the case of engine repairs at Oklahoma City—this has been a feature of day-to-day operations rather than a tool that is incorporated into surge planning. Thus, the resource represented by industry is one that may be underutilized during surge periods. Contract employees are used to fill needs but have not been formally incorporated into surge planning.

Finally, we speculated that while depot organization and management have transformed over time, planning for surge has not seen the same explicit change. Any change in surge planning has come as an outgrowth of other improvements rather than as a result of a focused effort to improve surge planning specifically. For example, as

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[13] This approach is implicit in Congress's description of depot planning. It assumes either that the existing workforce could sustain a high level of overtime over a long period or that enough skilled workers could quickly be hired to sustain organic surge.

[14] We will summarize this legislation and the related congressional debate in Chapter Two.

mentioned above, the Depot Maintenance Master Plan barely touches upon surge except for the question of financing it. We must note, however, that the Air Force does have a number of transformation initiatives under way that can also enable a more strategic view of surge relevant to this new environment.

These hypotheses and their implications are interdependent. The changed reality of surge should be driving the change in surge planning. It also may offer a new kind of opportunity to integrate contractors into the surge planning function. We contend that as the depot organization evolves over time it should include the flexibility to evaluate and take advantage of the best value in repair (whether organic or contractor) during contingencies as well as during normal peacetime operations.

We incorporated three approaches to explore these hypotheses.

First, we wanted to understand how the concept of surge developed from its modern historic roots to where it is today. This involved a careful review of the public record of congressional debates, General Accounting Office (GAO)[15] reports on depot operations, DoD policy memoranda, and Air Force regulations and instructions. The subject has been the matter of debate for years, so what appears here is only a summary of a very complex topic. We have tried to capture some of the complexity along with the lack of clarity in the issues.

We also wanted to better understand how the Air Force actually manages surge today. This required detailed discussions with officials in our sponsoring agency, personnel at Headquarters AFMC and all three Air Force ALCs; a review of Operation Plan (Oplan) 70 (the headquarters and depot documents that describe surge operations), and a limited examination of historical data on overtime and on the number of repairs at the depots.

Finally, we tried to integrate insights from depot managers with the results of earlier RAND research to suggest next steps, along with a new vision of surge operations, for the Air Force.

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[15] On July 7, 2004, the GAO's name was changed to the Government Accountability Office.

Preview of Findings

Our findings broadly supported our hypotheses. We found that the nature of "surge" has changed. The Cold War model of surge being a major increase in production (implicitly, up to two or three times normal production) no longer holds. Now surge is more commonly characterized by a series of smaller increases in production as depots respond to smaller and shorter-term contingencies. Furthermore, contractors are not well integrated into surge planning, and industry offers a potential and largely untapped resource for surge. Finally, depot organization and management have changed over time, but surge planning has not been a principal focus of transformation efforts to date.

Our findings lead to the conclusion that surge has become part of regular ongoing depot activity instead of an unusual event. We have a number of suggestions as to how the Air Force should approach surge in this new environment. Appropriate planning can help the depots proactively prepare for expected conflicts. The Air Force should incorporate a variety of initiatives as it develops an approach that recognizes that surge is part of normal operations. These include benchmarking internal operations with those of contractors, improving (and in some cases centralizing) data systems, and incorporating contractors into the surge planning process.

Organization of the Report

Chapter Two of this report begins with an examination of "first principles" behind the terms "surge" and "core" and of how the Air Force has interpreted and responded to congressional requirements. It includes a brief history of the congressional debate, demonstrating how some of the uncertainties about these terms came to be. Chapter Three uses production and overtime data from the depots, as well as flying hour data, to argue that the nature of surge operations has changed: Depots are unlikely to be asked to provide huge increases in production in response to a Cold War scenario, but they will be

expected to maintain a relatively steady high level of production. Chapter Four describes some opportunities for improving the management of surge operations. Chapter Five takes a broader approach to rethinking surge. Chapter Six concludes with recommendations for next steps that the Air Force can take.

CHAPTER TWO

First Principles: "Core" and "Surge"

This chapter summarizes congressional[1] concerns regarding the issues of core and surge maintenance and then provides a more detailed history of the legislative process that has driven depot policy for the last two decades. The congressional debate is important to understand because legislative actions constrain the Air Force's flexibility in managing its repair needs. Air Force officials have also pointed to legislation as a reason for why they cannot engage in certain activities, which may be based on a misunderstanding of the actual record. Thus, this summary provides the background of some actual and perceived constraints on Air Force activity.

Congressional Principles

The ideas of "core capabilities" and "surge" are linked, since part of the former is the ability to manage repair during periods of wartime surge. However, excavating the "first principles" underlying core and surge was a surprisingly complex task. After extensive research, we found no original source with clear, formal definitions of these concepts. Rather, the ideas and the definition of core and surge arose from the legislative process itself, as members of Congress asked DoD for insight into how it defined core and surge. The resulting discus-

[1] See the Appendix for a more detailed discussion of legislation related to core and surge.

sion and debate, which has been going on for decades, has led to the legislation that exists today.

The "modern history" of this issue began over two decades ago, when Congress formally stated the requirement for the maintenance of a "core logistics capability" in the FY 1984 National Defense Authorization Act:

> It is essential for the national defense that Department of Defense activities maintain a logistics capability (including personnel, equipment, and facilities) to ensure a ready and controlled source of technical competence and resources necessary to ensure effective and timely response to a mobilization, national defense contingency situations, and other emergency requirements.[2]

The word "core" appears in the paragraph title ("Necessity for Core Logistics Capability") of the preceding text but not in the paragraph text itself. However, beyond the above language, the law did not define what this core capability was, nor did it define the types of contingencies for which those capabilities were necessary. The need for surge capability was also not addressed (nor was the word "surge" even used).

The Congressional Record shows that the original intent of the language was to force DoD to develop a list of jobs that should be retained as government positions,[3] but DoD did not provide such a list in its initial response. Instead, the Deputy Secretary of Defense offered information on facilities, equipment, and management personnel used to perform depot functions and noted:

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[2] Public Law 98-525, October 19, 1984, codified in U.S.C. Title 10, Section 2464, paragraph (a)(1).

[3] Representative Nichols, the sponsor of the amendment that became Public Law 98-525, later said that the language was "an effort to get a partial list of readiness related jobs that were to be exempted from A-76 review" (see the Congressional Record, 131 Cong. Rec. H4853, May 14, 1985). Circular A-76 (Revised 1999) lays out the intent to keep in-house all functions that are inherently governmental and to outsource those functions that could more appropriately be performed by contractors in the commercial sector.

> It is the policy of the Department of Defense to maintain an in-house capability, managed by government personnel and operated by either government or contractor personnel (or both), to meet the wartime requirements for depot level logistical support to the armed forces. It is also necessary to maintain a commercial-industrial base to perform the same type work.[4]

Thus, instead of listing jobs that should not be subject to A-76 competitions, the DoD response emphasized that both government *and* contractor personnel were necessary to meet military support requirements. After a testy exchange in which Representative Bill Nichols accused DoD of intentionally misinterpreting the intent of the legislation, the Secretary of Defense responded that the real issues involved were the need to "maintain flexibility to allocate resources in such a way as to enhance the overall readiness of our armed forces" and "whether we can rely on private contractors to perform essential work at defense depots."[5]

This exchange led to an amendment by Representative Nichols that included a lengthy list of specific functions that would be considered "necessary to maintain the logistics capability of the Department of Defense."[6] Since then, congressional debate along with other disputes between Congress and DoD have continued over what "core" capabilities might be and how the retention of these capabilities within the government should be accomplished.

A careful reading of the Congressional Record reveals that legislative concerns with weapon system maintenance revolve around who should do the work: government employees or outside contractors. The common theme is that relying on industry to conduct repair work involves a set of risks that do not exist if the work is performed by organic government sources. The basic concern is that contractor

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[4] Letter from William H. Taft IV, Deputy Secretary of Defense, to the Honorable Les Aspin, Chairman of the House Armed Services Committee, March 29, 1985 (found in 131 Cong. Rec. H4853, June 25, 1985).

[5] Letter from Secretary Weinberger to Representative Nichols, May 24, 1985 (found in 131 Cong. Rec. H4853, June 25, 1985).

[6] 131 Cong. Rec. H4853, June 25, 1985.

sources of repair are less reliable than in-house sources, and somehow repair services would not be available when necessary. These risks are described at such length that much of the debate has a "worst-case" flavor, in which the risks seem to be considered almost as certainties. Concerns about managing a variety of business risks, maintaining skills for future emergencies, and ensuring that resources are carefully and appropriately managed are the stated drivers of congressional action.[7]

Potential Risks of Outsourcing

One major concern expressed by Congress is the potential loss of the organic skill base if the government no longer performs the repairs, as well as the subsequent difficulty of reconstituting organic capability if the contractor decides that the work is no longer worthwhile. Furthermore, a contractor that goes out of business will not be able to meet its commitments at all.[8] This is especially a concern with aging weapon systems, for which a declining number of systems and little chance of new business may lead firms to exit the business and deploy their assets elsewhere. The risk is that the government could face a gap of unpredictable length in the availability of repair, which could have problematic consequences—especially if a contingency arose.

A second issue is the need for periodic re-solicitations of contracted work. Certain long-term contracts are barred by law because of the legal requirement that there be adequate competition in government contracting, so the government may be limited to issuing a contract with an initial five-year term, with perhaps five years of options for good performance. Ten years is a long contract term, but eventually the work will have to be re-competed if there is a chance that another company could perform it. If another contractor then wins the work, it will have to be moved, which could create disrup-

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[7] Another congressional concern not overtly stated but implicit in the discussion is that of preserving jobs in home districts as a way to increase reelection prospects.

[8] No concrete examples of this risk were provided.

tions in supply.[9] Although "best value" is supposed to incorporate this and other measures of supply risk, it can be difficult (although it is done) for the government to issue a contract to anyone other than the lowest bidder, which can lead to potential disruptions. However, it is not unreasonable to believe that the effects of these disruptions can be planned for and managed.

The government also has a great deal of control over its organic sources—much more than it has over a contractor. When the work is done in-house, the government can increase production in case of contingencies by assigning overtime. Such an increase may not be possible if a contractor is doing the work, particularly if that contractor has many other, additional demands to meet. For a busy company, government contracts may make up only a small part of its total revenue stream, meaning that the needs of its other customers may take priority. Contracts can be written to take government surge into account, ensuring that the contractor both invests in adequate capacity and promises to prioritize government work. The depot personnel we interviewed suggested that this is generally a costly alternative (although they did not provide specific data). However, it should be noted the government does not in fact have the unlimited ability to increase production by assigning overtime, as at some point a limit to the employees' ability to take on more work will be reached. It also may make economic sense for the government to pay for contractors to maintain unused capacity rather than to maintain such capacity in-house. This question should be subject to analysis.

Finally, there is the concern that opportunistic contractors will "hold up" the government, buying into a contract at a lower price, and then, when the government loses the organic capability and has no other alternative, increasing the prices that the government must pay. Again, this has been asserted without data, so the extent of this risk is unknown. This risk is also related to other concerns that somehow the government will be left without a source for repair.

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[9] Again, no examples were provided.

It should be noted that some members of Congress have consistently pointed out that contractors have been known for good performance both in peacetime and in wartime. Employees of contractors should not necessarily be assumed to be less patriotic or less likely to perform well than would government workers. However, the implicit or overt lack of trust in contractor sources has been a consistent feature of the legislative debate.[10]

Limits on Outsourcing

Congressional concerns have led to legislation limiting the amount of maintenance work that the military services can contract out. In 1991, this limit was set at 40 percent, meaning that a minimum of 60 percent of the funds spent by the depots was to be spent on work done by government employees.[11] In 1997, the maximum amount of work that could be contracted out was increased to 50 percent.[12] This money supports a large government depot sector and hence has led to an interested and organized congressional depot caucus that carefully follows the issue. Although the depot caucus has been criticized as lobbying for what amounts to a jobs program, congressional interest

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[10] In his letter to Representative Nichols (1985), Secretary Weinberger said, "Private contractors have served the Nation ably in past conflicts, even overseas and in hostile areas, and I am confident that we can depend on them in the future. They employ the same loyal, patriotic U.S. citizens we do."

[11] Public Law 102-190, Div A, Title III, Part B, Section 314(a)(1), 105 Stat. 1336, December 5, 1991.

[12] Public Law 105-85 (November 18, 1997) changed U.S.C. Title 10 (Section 2466, paragraph a) to read: "Not more than 50 percent of the funds made available in a fiscal year to a military department or a Defense Agency for depot-level maintenance and repair workload may be used to contract for the performance by non-Federal Government personnel of such workload for the military department or agency." Before 1997, the National Defense Authorization Act of 1994 had stated that the Secretary of Defense could not contract out more than 40 percent of the depot-level maintenance workload. The real effects of the change to 50 percent were minimal because of changes in how maintenance work was measured. The Air Force was required to include Interim Logistics Support in its calculations of depot work performed. During this research, we were informed that because contractors already performed much of that work, the Air Force did not gain significant flexibility to contract for logistics support.

in ensuring a stable and reliable source of supply, particularly during the surge state wartime, is understandable.

The topic of which work should be performed organically continued to be of interest to the legislature. In 1996, Congress found (or, rather, averred) that DoD "does not have a comprehensive policy regarding the performance of depot-level maintenance and repair of military equipment"[13] and directed the Secretary of Defense to develop such a policy to maintain an "effective and timely response" to mobilization, contingency, and other emergency requirements. The Secretary of Defense was directed to identify core logistics capabilities and the workload required to maintain those capabilities, and Congress changed the law to make it more explicit that core capabilities should be maintained at government-owned facilities by civil servants:

> It is essential for the national defense that the Department of Defense activities maintain a core logistics capability that is *Government-owned and Government-operated (including Government personnel and Government-owned and Government-operated equipment and facilities)* to ensure a ready and controlled source of technical competence and resources necessary to ensure effective and timely response to a mobilization, national defense contingency situations, and other emergency requirements.[14]

Thus, Congress continued to make clear that at least part of its concern was maintaining government jobs to perform repair.

Despite the use of the term "core logistics capability" in the legislation reported above, the concept of "core" functions has never been completely clarified. The language suggests that there is some required capability that can only be maintained by using all government sources, but it does not define what this "core" is. Does it include all types of repairs? Is it only the repair of aging weapon sys-

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[13] This finding was part of Public Law 105-85. See United States Code, 1994 Edition, Supplement IV, Vol. 1, p. 1217.

[14] Public Law 105-85, November 18, 1997 (emphasis added).

tems? Or is it the repair of systems for which commercial sources are unavailable?

In a 2003 report on depot management, GAO noted that the military services are still not accomplishing key analyses to identify essential core capabilities.[15] If "core" is anything more than a specific percentage of the workload, then these analyses are important. But the report also did not define what these "core capabilities" were.

The end result of this debate is that both public law and DoD policy stress the need for government personnel to perform core functions. The next question is: If some amount of repair work must be performed in-house to sustain core capabilities, how does this affect the amount of repair work done in-house during times of war? And during those surge periods, what repair is the government required to perform organically?

There does not appear to be any formal requirement that a certain percentage of surge activity must be accomplished by organic personnel. The 50 percent organic requirement refers to the total quantity of repair rather than to the specifics of either noncontingency or contingency operations. As long as the total does not fall below 50 percent organic production, it appears that there is no regulation that surge be done in-house.[16] This is important to note, because our interviews showed that some personnel responsible for surge planning at the ALCs believe otherwise—that is, they assume that surge capabilities are the same as core capabilities and must therefore be accomplished by government employees at government facilities. (Others understand that activities in support of surge can be performed at contractor facilities and therefore do engage in planning for this.) The lack of a consistent understanding of the permissibility of using contractors for surge may mean that the depots needlessly restrict their alternative sources of repair during contingencies. To

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[15] General Accounting Office, *Depot Maintenance: Public-Private Partnerships Have Increased, but Long-Term Growth and Results Are Uncertain*, GAO-03-423, September 2003.

[16] One of our reviewers noted that each service defines "core" and the 50/50 requirement differently. It can be measured at a variety of organizational levels, from individual depots to the entire service.

make sure that all allowable flexibility is incorporated into the system, ALC leadership should make a clear statement that sends the correct message to surge planners so that they can incorporate this flexibility in their activities.

It should be noted that the congressional debate focuses on military operations as being the cause of unexpected increases in repair needs. During our research, we found that, quite commonly, increases in workloads are also caused by so-called technical surprises, which occur when an unexpected problem with a part requires that all of the same parts on the same model of aircraft be inspected and, if necessary, repaired. For example, if inspection of one F-16's landing gear reveals some critical wear-related flaw, then all F-16s having that landing gear installed may be grounded until their gear is inspected and, if necessary, repaired. In the case of either a wartime contingency or a technical surprise, the question still remains as to whether or not all of the surge activity must be accomplished by organic personnel.

Congress plainly requires DoD to maintain a core logistics capability that is government owned and government maintained to ensure a "ready and controlled source of technical competence and resources"[17] to respond to surge requirements. By noting that the concept of "core" is not precise, we are not saying that there is no link between surge and core. We are simply noting that there is no apparent constraint that all surge requirements be accomplished by government facilities and employees. Indeed, the Air Force has already tacitly accepted this by making mission-essential exchangeables on the C-17 part of contract logistics support—that is, the entirety of this support, which undoubtedly increases during surge, is performed by contractors. If the nature of surge has changed, other opportunities for such contractor support might be possible.

While the congressional debate reveals both overtly and implicitly the concerns of the legislators, it does not reveal what "first principles" underpinned the development of the concepts of core and surge. Congressional concerns seem to focus on maintaining in-house

[17] Public Law 98-525 (1984).

capability as an insurance policy. In this report, we do not take issue with that desire. However, we address whether the legislation constrains how surge is managed, and our conclusion is that it does not. There is no apparent requirement to do 50 percent of surge repairs in-house, as long as the overall 50 percent organic requirement is met.

CHAPTER THREE

Changes in the Nature of Surge

In this chapter, we describe the Air Force's approach to managing surge and the service's recent experiences with surge operations.

The Air Force's Approach to Managing Surge

The Air Force has developed an approach to managing increases in production while staying within the congressional guidelines described above. Air Force documentation defines surge as the process of increasing production to meet the demands of combat operations of varying duration, size, and intensity.[1] During contingencies, the Air Force alters how it manages sustainment. These differences are centered on the command and control of logistics repair, the flows of information, the levels of production, and the speed of delivery.

There are three phases in surge management.[2] During peacetime, the depots engage in planning for surge, where they analyze their capability to support contingency operations and develop a plan for how to do so.[3] During the pre-implementation phase, the depots identify surge requirements for a specific scenario that may be looming on the horizon. Finally, during the contingency itself, the depots

[1] This characterization of surge is found in Attachment 2 to AFMC Plan 70 (definition of terms).

[2] See Annex D, paragraph 3, of Warner Robins Plan 70.

[3] This includes an analysis of their facilities and fixed equipment capacity.

surge the actual production (repairs) and distribution in response to what is required. The Air Force does in fact engage in planning for surge at both organic and contractor sources,[4] although the depot plans are much more articulate on the subject of organic surge.

Even during surge periods, the depots continue to support other, non-surge Air Force elements. However, as we will discuss later, surge and peacetime support have, to some extent, merged, and the Air Force now faces the challenge of managing "boiling" peace and contingency operations in the same way.

Overall guidance for the preparation of surge management plans comes from Headquarters AFMC, although the depots have considerable independence in the writing of the Depot Surge Contingency Plan 70 (more commonly known as Oplan 70). They are not required to consult with each other during this process. However, to a greater or lesser extent, some information exchange does take place.

The plans are required to include certain information. For example, they must include information on how any contingency workload can be supported while at the same time meeting the requirements for ongoing support.[5] They must also describe how supply chain managers who are not located at the particular depot will participate in surge planning.

It should be noted that there is some decentralization in surge execution as well as in surge planning. For example, local surge plans can be initiated by the local ALC commander, as well as by Headquarters AFMC and the Air Staff.[6]

Evidence for Change in the Nature of Surge

We now return to our initial hypotheses in the context of how the Air Force has arrived at its current practices for managing surge. We have

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[4] See paragraph 6d of AFMC Plan 70.

[5] See paragraphs 2 and 3 of the Plan Summary of AFMC Plan 70.

[6] See paragraph 4b of AFMC Plan 70.

argued that because the nature of surge has changed, because contractors are not as well integrated as they could usefully be in surge planning, and because depot reorganizations have not sufficiently identified surge planning as part of their restructuring, it is time to revisit the principles of how the Air Force plans for surge. Although the data unfortunately were not as rich as hoped, our research found support for these hypotheses.[7] With the data available, we made an effort to approach the question of surge from a variety of different points of view. For the rest of this chapter, we provide evidence in support of our contention that the Cold War surge model is no longer valid. The data that exist do show that the nature of surge has changed—or it may even be that the implicit concept of "one shift is reserved for core, and second and third shifts are reserved for surge" may never have been necessary. The contingencies in which the United States is getting involved are smaller and of relatively short duration, instead of being drawn-out, massive conflicts, such as the Vietnam War or World War II. For example, during OIF, only four special operations forces aircraft were accelerated.[8] Furthermore, the military is preparing itself to meet a variety of threats of different sizes rather than waging two simultaneous major combat operations (MCOs). In an article in the May/June 2002 issue of *Foreign Affairs*,[9] Secretary of Defense Donald Rumsfeld stated that the new force-planning construct for DoD comprised the following:

1. Deterrence in four critical theaters, backed by the ability to
2. Swiftly defeat two aggressors in the same time frame, while
3. Preserving the option for one massive offensive to occupy an aggressor's capital and replace the regime and
4. Have the ability to execute several lesser contingencies.

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[7] As we will describe, this very lack of data is an issue we think the Air Force should contend with and try to resolve.

[8] We heard this in discussions with depot personnel.

[9] "Transforming the Military," *Foreign Affairs*, Vol. 81, No. 3, May/June 2002.

The following figures show that since September 11, 2001, depots have been able to manage conditions 3 and 4 without excessive increases in overtime. Fortunately, situations 1 and 2 have not yet been tested, but it is not clear that the nature of surge in those situations would require that all surge capabilities remain in government-owned and -operated facilities.

Depot Production Data

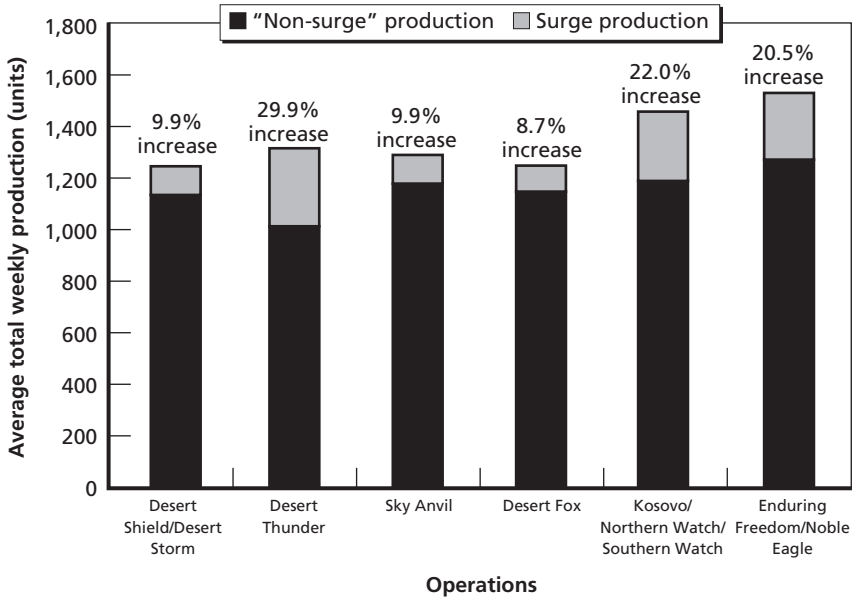
We begin by exploring some data on production at individual depots and on total depot production. Warner Robins provided information on surge production hours for avionics equipment for contingencies since late 1990, and noted that its avionics and instruments division was in formal surge mode for the following periods:

- Desert Shield/Desert Storm (August 8, 1990–July 4, 1991)
- Desert Thunder (February 7–April 16, 1998)
- Sky Anvil (October 14–November 12, 1998)
- Desert Fox (December 17, 1998–January 22, 1999)
- Kosovo, Northern Watch, and Southern Watch (all three from February 20–July 19, 1999)
- Enduring Freedom, Noble Eagle, and part of Iraqi Freedom (September 19, 2001–May 2003 in these data).

Figure 3.1 shows the average weekly production of avionics and instruments (in units).

Each bar in the figure represents the total number of units produced and shows the percentage increase that surge activity represents over normal production, which ranges from about 10 percent for Desert Fox to just under 30 percent for Desert Thunder. The weighted average surge increase over normal production (where increases are weighted by length of contingency) is 18 percent of the workload, as characterized by repairs to support units that have a Joint Staff priority code. (Note that 18 percent is probably an over-

Figure 3.1
Average Weekly Avionics and Instruments Production at Warner Robins



RAND *MG372-3.1*

estimate of surge production because some of these repairs would have been necessary regardless.) This is obviously much less than the 200 percent surge capacity (two extra shifts) that the government has implicitly built into the system by suggesting that normal operations repair work should be conducted during a single shift.[10]

Next, we look at production data from all depots. One possible measure of surge is the amount of repair work undertaken within JCS project codes tracked by EXPRESS. These are identified at the depot to gear up production in particular areas of concern.

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[10] Such a scenario assumes the possibility of some relatively rapid hiring or mobilization of skilled labor, which may not in fact be quickly obtainable. In the short run, current employees could work overtime, but a large increase in hours worked is not sustainable over the long term if additional workers are not available.

However, using JCS project code production to understand surge does not provide a true measure of surge activity, because some portion of the work would have been performed anyway, perhaps with a different priority. It also underestimates reconstitution of parts after the contingency, since some of these repairs would have resulted from the operation but are not undertaken until after the operation, when wartime JCS codes are no longer in effect. For these reasons, one of the better sources of information is that available from the D-200 database.[11] Figure 3.2 plots all repairs by source of supply (SOS) for each depot. The depot responsible for managing the repair is the SOS. The actual repair may take place at that depot, at a different depot, or at a contractor's site. (SOS is not an accurate representation of actual repair workload at a depot, but the total number provides insight into Air Force repair activities as a whole.)

Looking at the last 14 years since 1989, the drawdown in Air Force force structure is revealed by the declining number of repairs in the very early 1990s. The closure of depots at Kelly Air Force Base, Texas (San Antonio Air Logistics Center), and McClellan Air Force Base, California (Sacramento Air Logistics Center), in the late 1990s is also clear in the figure as the amount of work managed by those depots declines and then disappears.

But the most important point that this figure makes for our purposes is that there is no obvious correlation between increases in repairs and participation in contingencies. Since Desert Shield/Desert Storm, the Air Force has been involved in (among others) the following major operations shown in Figure 3.3:[12]

- Operation Sky Anvil (Balkan/Kosovo operations, October 1998)
- Operation Desert Fox (December 1998–January 1999)
- Operation Noble Anvil (Kosovo, late February–June 1999)

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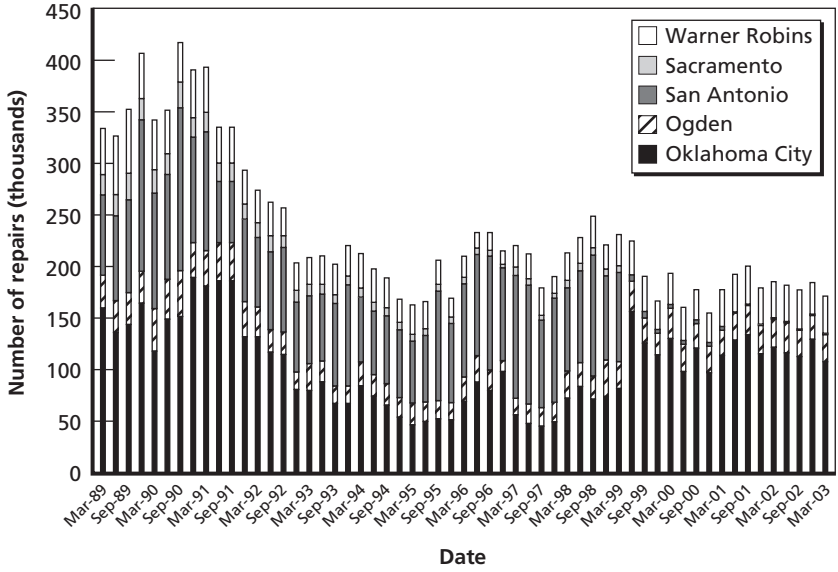
[11] This is an historical database that captures all repair actions by individual stock number. It can be aggregated into Federal Stock classes.

[12] The dates here are approximate. Some of them come from the Federation of American Scientists' Web site, at www.fas.org.

Figure 3.2
Number of Repairs by Source of Supply



RAND *MG372-3.2*

- Operations Enduring Freedom (Afghanistan), Noble Eagle (homeland defense), and Iraqi Freedom (September 19, 2001–present).[13]

For example, while there is an increase in the number of repairs from March 1998 to September 1998, as shown in Figure 3.2 (which covers the period of Desert Fox), there is a similar increase from March 1996 to September 1996, which does not correspond to a named operation, and repairs show relatively minor variations since March 2001.

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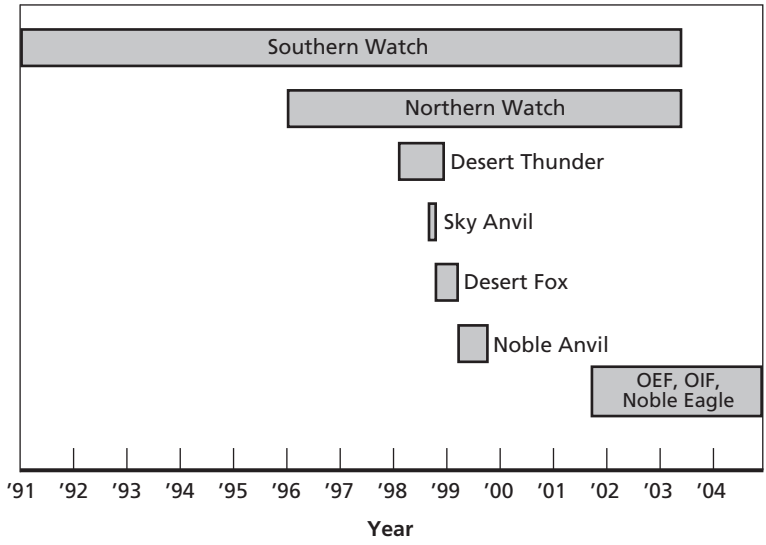
[13] This includes the initial phase of the Iraq contingency, which was the most intensive phase of that campaign in terms of air power requirements.

Figure 3.3
Timeline for Major Operations



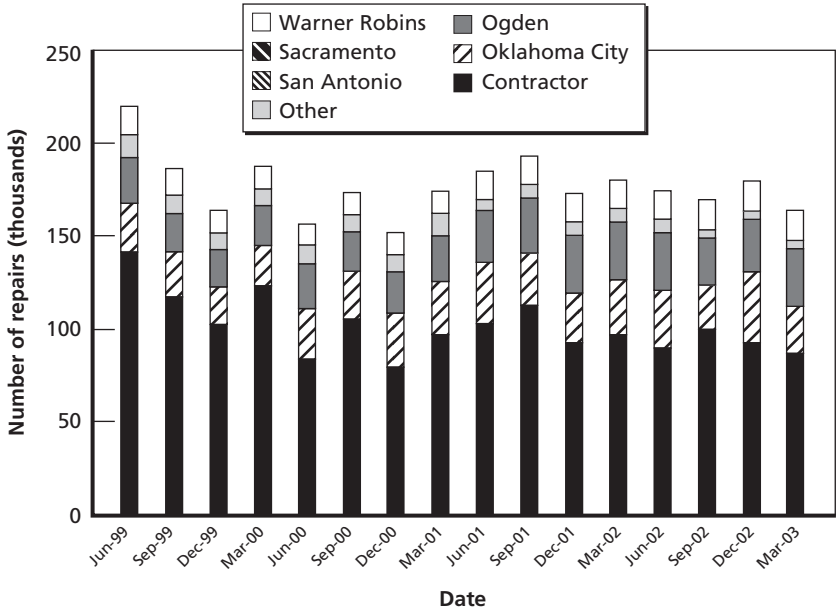
RAND *MG372-3.3*

Figure 3.4 shows the number of repairs by source of repair (SOR), which indicates where the work was actually performed (i.e., by one of the depots or at a contractor site) for the nearly four years from June 1999 to March 2003.

Figure 3.4 shows that in spite of the formal state of surge in which the depots have operated since shortly after the events of September 11, 2001,[14] the number of repairs does not provide dramatic evidence of the large upswings predicted in a Cold War model of surge. Another insight revealed by examining the source data is that the levels of contractor and depot production both increase and

[14] At a June 16, 2003, briefing at Warner Robins, we were told that the ALC issued directions to battle staff to implement Oplan 70 for surge immediately after September 11, 2001. A March 26, 2003, message from the AFMC Battle Staff (Maj Gen Terry Gabreski) directed all the ALCs to implement their Oplan 70s; this message was used at Warner Robins to reemphasize surge conditions.

Figure 3.4
Number of Repairs by Source of Repair



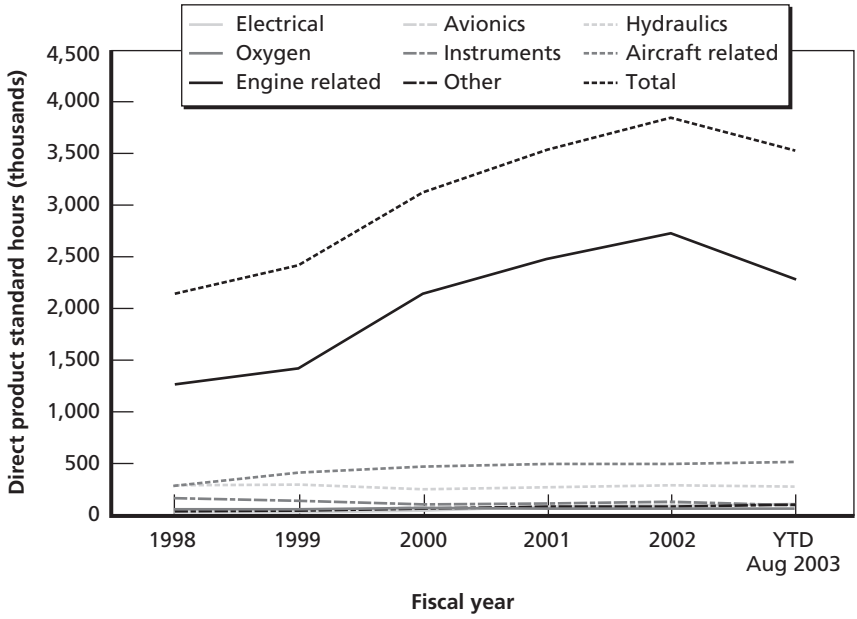
RAND *MG372-3.4*

decrease at about the same rate. Surge has not led to a noticeable shift in the organic-contractor repair mix, suggesting that the depots do not turn exclusively or primarily to organic sources when confronted with the need to surge.

Note that we are looking at both the SOR and the SOS data in terms of how *contingencies* might affect the numbers of repairs. It is also possible that "technical surprises" might cause unexpected increases in workload. While there may have been some during this time period, it does not appear that they have driven significant increases in workload.

Evidence for surge can also be sought in data on production hours. Figure 3.5 shows the direct product standard hours by tech-

Figure 3.5
Direct Product Standard Hours by Technology Repair Center at Oklahoma City



RAND *MG372-3.5*

nology repair center at Oklahoma City from FY 1998 to August 2003.[15]

Total repair hours for exchangeable items increased by 79 percent from FY 1998 to FY 2002 (driven by the large increases in engine repairs), a period during which the Air Force had to take on many small- to medium-size operations. Avionics and electrical repairs trended upward during this period, with dramatic increases

[15] A direct product standard hour is the amount of acceptable quality work that can be accomplished in 1 hour by qualified workers, following prescribed methods, working at a normal pace and experiencing normal fatigue and delays. (Definition from General Accounting Office, *Air Force Depot Maintenance: Budgeting Difficulties and Operational Inefficiencies*, GAO/AIMD/NSIAD-00-185, August 2004, p. 10.)

that are not evident because of the scale of the graph, but they represent only 4.5 percent of the total number of repair hours.[16]

Figure 3.5 also shows engine repair increases from FY 1998 to FY 1999, a period that included Desert Thunder, Sky Anvil, Desert Fox, and Operations Northern and Southern Watch. However, the engine repair increases do not show any reductions that would be expected after an operation is over—for example, there is no decrease in repairs in the relatively quiet period from FY 1999 to FY 2001. These increases in engine repairs may be driven by a range of engine-specific problems, including aging effects.

We can also look at direct product standard hours by division, as in Figure 3.6, which includes total hours for Oklahoma City for a longer period of time.

These production hours also fail to show the significant spikes in workload that one would expect from a Cold War model of surge. It is not quite a steady state, and there may be increases relating to operations in Kosovo (FY 2000) and OEF/OIF, but the largest percentage increase in hours (29 percent) occurs for the engine division (MAE) from FY 1999 to FY 2000.

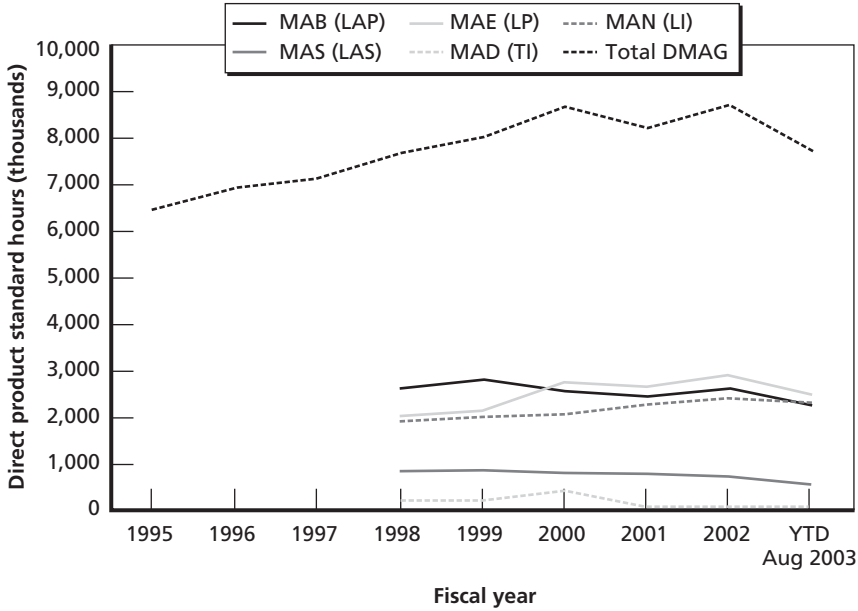
Depot Overtime Data

Workforce availability for surge and the workload of surge are important issues for Congress, so the effect of surge on workload is worth looking at more closely. For this, we will look at information about overtime. We are again limited to data from Oklahoma City.

Figure 3.7 displays overtime performed each month from October 2001 to July 2003 at Oklahoma City. Each bar represents the percentage of overtime for the given month. Since Oklahoma City

[16] Electrical hours increased from 25,000 to 86,000 in this period, but there was a dramatic increase in hours (from 33,000 in FY 2000 to 83,000 in FY 2001) that may have been the result of taking in work from other depots that had closed. Avionics increased from 15,000 to 90,000 hours over this period, again with a dramatic increase from FY 1999 (19,000) to FY 2000 (58,000).

Figure 3.6
Direct Product Standard Hours by Division at Oklahoma City



NOTE: MAB = Aircraft Division, MAE = Engine Division, MAN = Commodities Division, MAS = Software Division, MAD = Industrial Services Division, DMAG = Depot Management Activities Group.

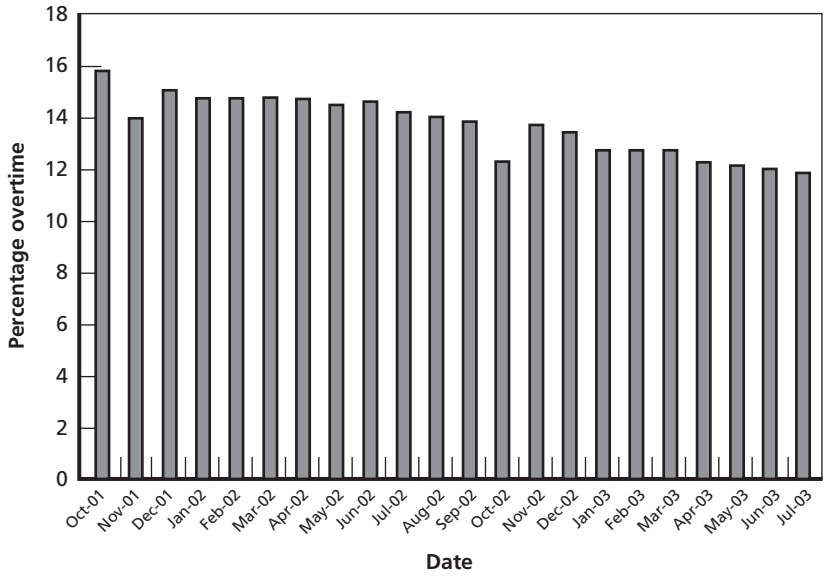
RAND *MG372-3.6*

formally went into a surge mode after September 11, 2001, overtime has averaged 13.6 percent. The personnel we spoke with there and at the other ALCs reported that the level of overtime even after surge began essentially represented business as usual. So using even this low level of overtime as the measure of surge for the OEF/OIF period overreports the true increase in work.

Figure 3.8 offers further evidence that overtime levels at Oklahoma City since September 11, 2001, were similar to levels before that time.

Figure 3.8 shows percentage-of-overtime levels for several individual divisions (with disaggregated data going back only to FY 1998)

Figure 3.7
Percentage of Overtime at Oklahoma City

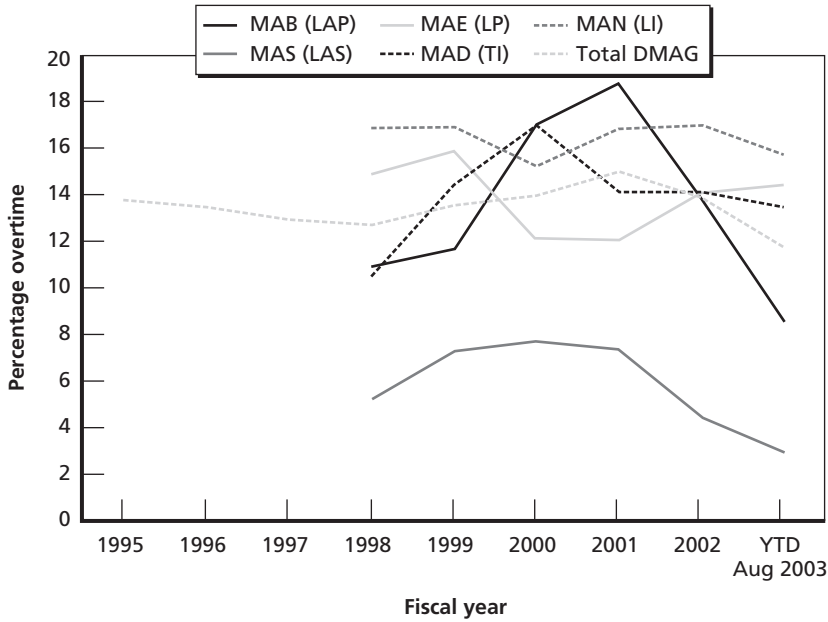


RAND *MG372-3.7*

and for total Depot Management Activities Group (DMAG)[17] operations back to FY 1995. Total levels hovered near 14 percent and have been fairly steady, averaging 13.5 percent. Individual divisions (such as MAB, the aircraft division) have shown some large swings in overtime, but these show up in FY 2000 and FY 2001, when no named

[17] A RAND report states: "The DMAG directly and indirectly supports the warfighter. It provides programmed depot maintenance (PDM) and related services directly to the warfighter, and it repairs components for the Supply Maintenance Activity Group (SMAG), which in turn provides them to the warfighter." The DMAG is where the majority of AFMC logistics support costs are incurred. "The DMAG funds all programmed and nonprogrammed maintenance in AFMC. The DMAG buys materiel from the Supply Maintenance Activity Group (SMAG), but unless this materiel is new, the DMAG is responsible for returning it to serviceable status, so much of what the DMAG pays the SMAG simply covers DMAG costs incurred earlier." Edward G. Keating and Frank Camm, *How Should the U.S. Air Force Depot Maintenance Activity Group Be Funded? Insights from Expenditure and Flying Hour Data*, Santa Monica, Calif.: RAND Corporation, MR-1487-AF, 2002, pp. xiv and 5.

Figure 3.8
Percentage of Overtime by Division at Oklahoma City



NOTE: MAB = Aircraft Division, MAE = Engine Division, MAN = Commodities Division, MAS = Software Division, MAD = Industrial Services Division, DMAG = Depot Management Activities Group.

RAND *MG372-3.8*

contingencies (except the continuing activity of Operations Northern and Southern Watch) were under way. Increases and decreases in overtime cannot be clearly tied to the series of contingencies that took place in that time frame.

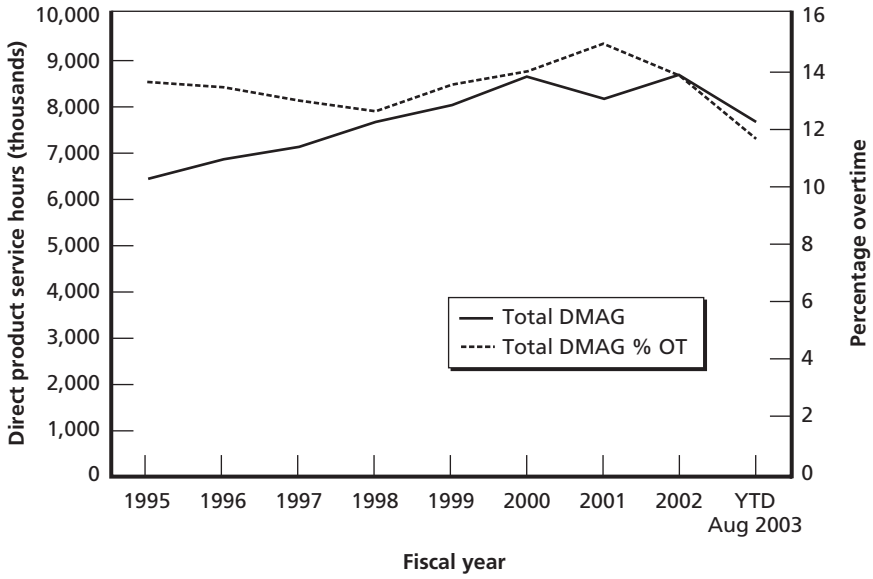
Interviews conducted at Ogden and Warner Robins confirmed that they too had similar experiences during these last few years.

To gain more insight into depot reactions to surge operations over time, we plotted overtime percentages and production hours on the same charts for different divisions at Oklahoma City to search for any patterns. For example, one would expect that increases in production resulting from the demands of contingency operations might be accompanied by increases in the amount of overtime required. Dramatic increases in overtime during small increases in production

hours could be an indication of undercapacity or an inadequate supply of government depot personnel to respond to increases in demand.[18]

Figure 3.9 shows that from FY 1995 until FY 1998 the number of direct product standard hours at Oklahoma City rose gradually, but the percentage of overtime declined. From FY 2000 to FY 2002, hours went down, then up, while overtime went up, then down.[19] The relationship in individual divisions can be more surprising, as Figure 3.10 shows for MAB at Oklahoma City.

Figure 3.9
Direct Product Standard Hours and Percentage of Overtime for Oklahoma City

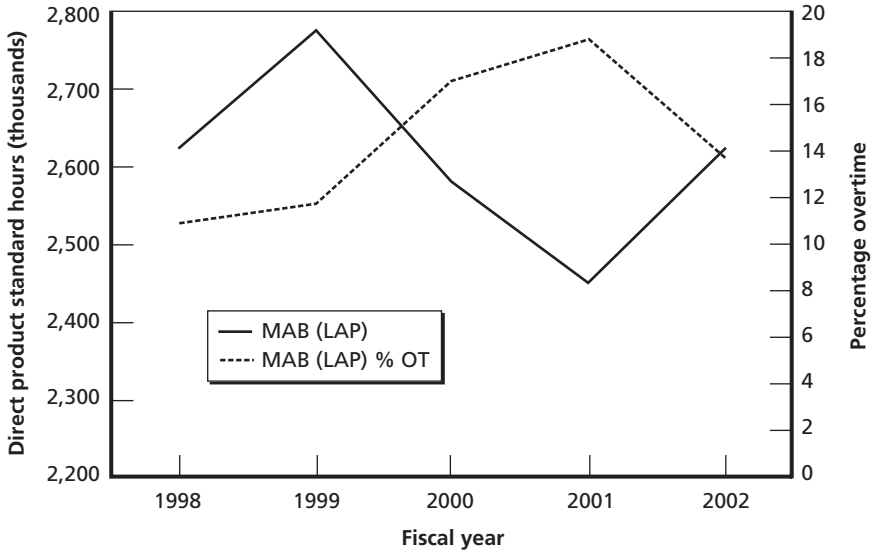


RAND *MG372-3.9*

[18] Changes in the number of workers would obviously affect the interpretation of these overtime figures—fewer workers being asked to produce more would have to work more overtime—but personnel we interviewed at the depots made no mention of significant changes in the size of the workforce.

[19] The correlation coefficient of direct product standard hours with percentage of overtime during this period is 0.42.

Figure 3.10
Direct Product Standard Hours and Percentage of Overtime for the Aircraft Division at Oklahoma City



RAND *MG372-3.10*

In Figure 3.10, there appears to be hardly any relationship at all between changes in hours and the percentage of overtime.[20] However, it is unwise to draw too much from this without understanding more specifics about the history of work at Oklahoma City. We can speculate on a number of possible explanations for this, including that there might be over-employment in non-surge times, that the data are inaccurate, and so forth. Whatever the reason, it does appear that Oklahoma City can handle current surge requirements without excessive strain on its workforce—at least the historical record does not show that production increases necessarily lead to serious increases in overtime.

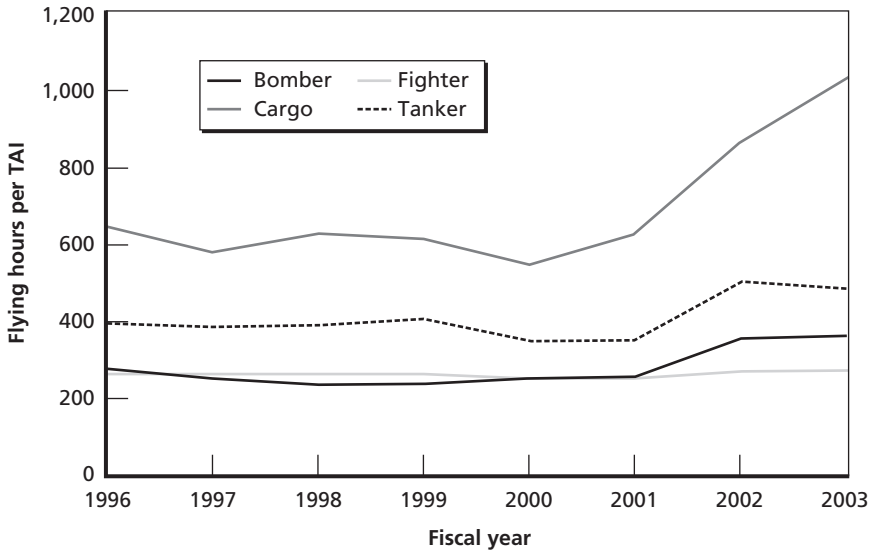
[20] The correlation coefficient between direct product standard hours and percentage of overtime for MAB is (–0.81), indicating that the relationship is one in which the two move in opposite directions most of the time.

Flying Hour Data

As we have seen so far, the depots have not experienced massive increases in overtime in recent years despite Air Force participation in several contingency operations. A possible explanation for this is that despite these contingencies, demands placed on airframes and aircraft parts have not increased significantly. To check this, we looked at the empirical record of activity rates among the combat and combat support forces. Figures 3.11 through 3.13 show the gross trends in flying hours, sortie rates, and sortie duration. These are measures of activity that support both peacetime flying and combat operations.

The data on flying hours since 1996 in Figure 3.11 show increases in flying hours after the events of September 11, 2001. This has been particularly true for cargo aircraft, although bombers and tankers have demonstrated increases as well. (Fighter flying hours have been relatively flat.) As can be seen, the general periods associ-

Figure 3.11
Flying Hours per Total Active Inventory: Annual Data, FY 1996 to FY 2003



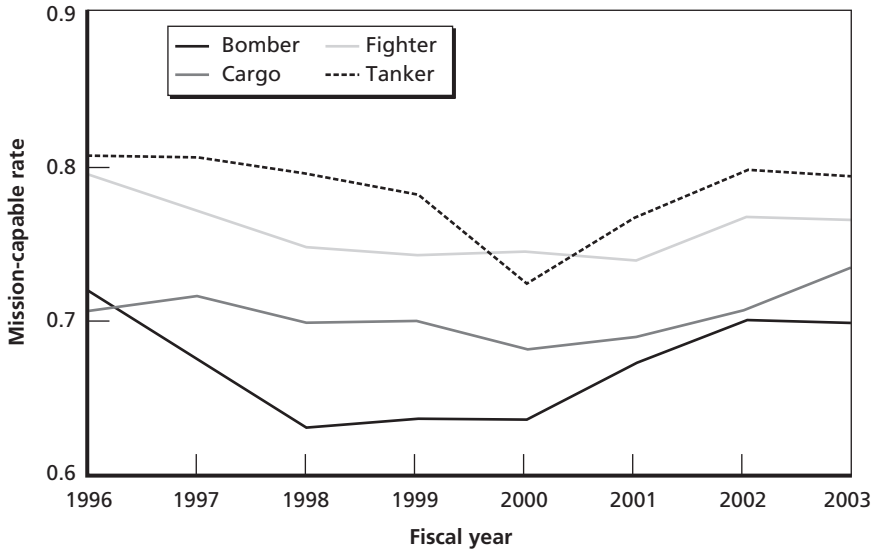
RAND *MG372-3.11*

ated with contingency operations (OEF in 2001, OIF and Operation Noble Eagle in 2003) show large increases in the activities of the airlift/tanker and bomber fleets.

The depots have been able to meet the needs of the fleet with little increase in overtime (as described above). This shows that even if operational needs increase, depots are able to meet surge requirements in a "business as usual" manner. The variety of tools used to manage surge, including, for example, EXPRESS and JCS project codes, have allowed the depots to meet any changes in demand with little visible disturbance to their normal operations.

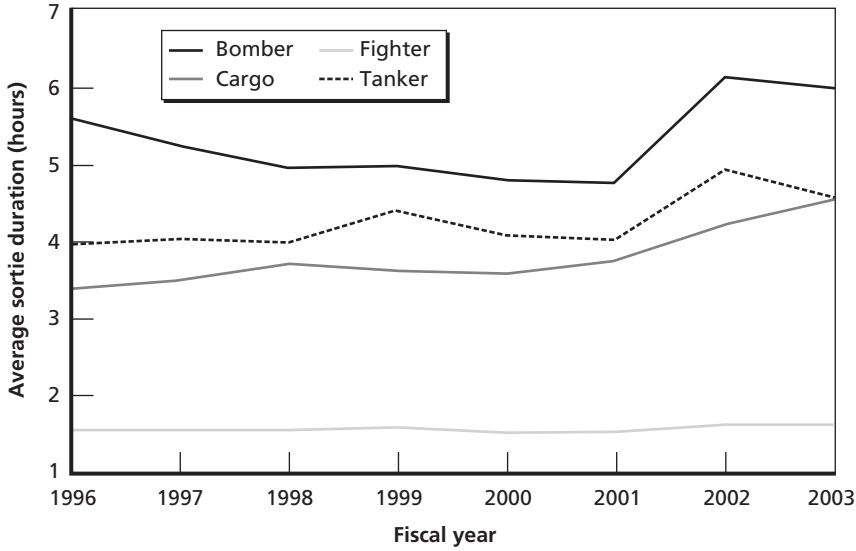
Figure 3.12 shows that there was a general decline in mission-capable (MC) rates from FY 1996 until FY 2000, but despite increased aircraft operations, those rates have continually improved since 2001 (except for a very small decrease in bomber MC rates from 2002 to 2003). MC rates are not a perfect measure because there may

Figure 3.12
Aircraft Mission-Capable Rate: Annual Data, FY 1996 to FY 2003



RAND *MG372-3.12*

Figure 3.13
Average Sortie Duration: Annual Data, FY 1996 to FY 2003



RAND *MG372-3.13*

be incentives, for example, to "game" them to get extra parts. However, the overall trend is consistent with our contention that ALCs are able to effectively perform their mission in the new environment characterized by almost constant surge.[21]

Finally, Figure 3.13 shows recent increases in average sortie duration for most Air Force aircraft. In spite of this increase, depot capacity has not been unduly stressed. This conclusion is based on the fact that overtime has not dramatically increased during this time, as seen in earlier figures.

Detailed data compiled by U.S. Central Command Air Forces (USCENTAF) and presented in *Operation Iraqi Freedom—By the*

[21] We were told that scheduled maintenance was not delayed because of contingency operations during the period covered by Figure 3.11. That is, non-MC repairs were not postponed during contingencies, so there were no increases in repair activity for these items after contingencies were over.

Numbers tell the same story.[22] For U.S. Air Force fighters during the first 30 days of the war, MC rates and Readiness Spares Package (RSP) fill rates were high, and sortie rates for fighter aircraft averaged 1.0 per day.[23] USCENTAF concluded that the MC rates for its fighters were significantly higher in war than during peacetime; however, fighter sortie rates were not significantly higher across the board.

Discussion

We have contended that in order to effectively plan for contingencies, the relationship between field activity rates (e.g., flying hours, sortie rates, and sortie duration) and what depots and their contractors produce must be understood. However, we have found limited evidence for a strong relationship between an increase in Air Force flying operations and depot production rates. Furthermore, we found empirical evidence from other studies that suggests that there is only a loose coupling of activity rates and repair actions.[24]

There are a variety of reasons why the relationship may not be proportional and indeed can be quite weak. One is that if stock levels of parts are adequate in many areas, then despite higher activity rates on the part of the combat forces, the depot will not need to increase production proportionately.[25] Another reason is that planning for contingencies can occur over a considerable amount of time. For example, the Logistics Support Analysis planning for OIF occurred over a six-month period. As a result, when Maj Gen Terry Gabreski issued the surge order for OIF on March 26, 2003, she, her staffs,

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[22] USCENTAF, Assessment and Analysis Division, *Operation Iraqi Freedom—By the Numbers*, April 30, 2003.

[23] The report says that the 293 Air Force fighter aircraft flew 8,828 sorties in 30 days, for an average of 294 sorties per day.

[24] See, for example, Keating and Camm (2002).

[25] We were told that in recent years stock levels have remained level and in some cases have gone up.

and the depot leadership had already done the work needed to implement the surge order, and indeed the depots had taken steps in anticipation of the order. Finally, all depots reported that they have been in "surge" since September 11, 2001, to anticipate likely future needs. As a result, depot work is not necessarily linked to actual demand at a fixed point in time.

Ideally, the depots and their contractors should continually scan likely future events to effectively anticipate and plan for repair demands. They should also be expected to plan for the flexibility to fulfill demands that are less expected—for example, those that arise from changed operational plans or poorly anticipated contingencies. Multiyear planning for the scenarios found in the Strategic Planning Guidance is the appropriate way to decide on the level and mix of resources to support the combat forces. The scenarios (e.g., two simultaneous MCOs) provide guidance for how the armed forces need to be prepared to fight. In turn, the depots need to plan for the ability to make whatever repairs would be necessary to sustain the scenarios laid out in the planning guidance. And the depots' response should be guided by experience. By this measure, Kosovo was an MCO, and depot planning for an MCO could start with the repair requirements generated from those operations.

We contend that the Air Force's response to the Strategic Planning Guidance should recognize the actual relationship between likely military operations and the activities of the depots and their contractors. Indeed, a complete review of the planning factors in light of what the data in this chapter have shown about the Air Force's experiences over the past 10 to 15 years would help align planning with experience.[26]

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[26] In fact, some evidence existed for this conclusion prior to the OIF experience. See Richard Hillestad and Amatzia Feinberg, *The Air Force in Small-Scale Contingencies: A Comparison of Planning Factors with the Actual Experience*, Santa Monica, Calif.: RAND Corporation, DB-437-AF, forthcoming.

CHAPTER FOUR

Improving the Use of Contractors in Planning Surge

In this chapter, we argue that contractors are not as well integrated as they could usefully be in surge planning. Furthermore, depot reorganizations have not sufficiently encompassed surge planning as part of their restructuring, nor do depots have data management tools that would help them do so.

Contractors and Surge Planning

Contractors perform a significant portion of the Air Force's required repair work, but as we have seen, the legal limit is currently 50 percent by dollars of total repair work (although the Secretary of Defense can issue a waiver). Not surprisingly, given the significant role they play in overall repair, contractors also participate in surge repair work. However, our research has found that the use of contractors and a thorough understanding of their abilities are not well integrated into the surge planning process. This is in spite of Headquarters' support for an approach that explicitly incorporates contractors.

In the Depot Surge Contingency Plan 70, Headquarters AFMC directed that depots work with contractors to allow for surge production:

> Since contractors also perform repair production, they must also have provisions to meet contingency requirements by increasing production. Depots are urged to take particular care when writ-

> ing contracts for mission critical workload to allow responsive surge production by contractor sources.

In our interviews at the depots, however, we found real concern about the downsides of formally incorporating surge clauses into contracts. Depot personnel indicated that adding such clauses generally increased total contract costs. They noted that it was usually possible for the Air Force to accelerate work without formal agreement. The acceleration would come at a price, but a price paid only if the work was actually needed.

Another possible cause for the reluctance to incorporate contractors in surge planning is ALC concern about contractor responsiveness in the event of surge even if surge provisions exist in the contract. For example, a strike at one single company responsible for repair of an important aircraft component during the operation in Kosovo was repeatedly cited as typical of the risks the depots faced when using contractors for repair.[1] This and other comments and issues aired during our interviews supported our hypothesis that contractors are not seen as true partners in the surge process, nor are they seen as good candidates for such a partnership.

Even if significant, these risks do not invalidate the reasonableness of an approach where contractors are integrated more broadly into surge planning. For example, if the choice is between paying for the contractor to stand ready for surge and paying for unused surge capacity in-house, then a cost-benefit analysis could be done to determine which approach makes the most economic sense. Where the risk of strikes exists, the Air Force could contract with companies to write "no strike if surge" clauses into their labor union agreements as a tool to mitigate this kind of risk. All of our interviews support the hypothesis that contractors are not seen as full partners in surge planning, and we contend that contractors could more effectively be made a part of the planning process. However, in spite of the lack of inte-

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[1] The repeated mention of the risk of strike was surprising since the strike that affected operations in Kosovo was the only example ever offered to show how a strike could affect the ability of the depots to complete their mission.

gration of contractors into surge planning, there has been an overall improvement in surge planning and execution over the past decade. These innovations will make it easier to incorporate contractors if and when that decision is made.

Depot Maintenance Transformation and Contractor Management

Air Force leadership has publicly committed itself to depot maintenance transformation as part of its interest in implementing improved purchasing and supply chain management (PSCM) practices.[2] Among these principles are using enterprise-wide leverage, introducing centralized commodity-focused sourcing, developing top-down strategic planning processes, and taking advantage of information technology that provides accurate and timely data.[3] The Air Force as an institution makes large purchases of various commodities and should be able to take advantage of this volume to gain concessions from suppliers. The idea of "commodity councils," teams of commodity experts who understand technical, production, and industry details and can use this understanding to develop long-range purchasing strategies, is also being introduced for some Air Force purchases, such as jet engine bearings.

Both surge and non-surge production can benefit from the application of commercial best practice purchasing and supply chain

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[2] The commitment to these principles was made in a "Commitment Declaration" for Sustainment Transformation signed by (among others) Gen Lester Lyles, Commander, AFMC; Maj Gen Kevin Sullivan, Commander, Odgen; Maj Gen Charles Johnson, Commander, Oklahoma City; and Maj Gen Donald Wetekam, Commander, Warner Robins.

This commitment declaration appeared in an October 2003 AFMC briefing entitled "Purchasing and Supply Chain Management," by Mr. Thomas Wells, Deputy Director for Contracting, Headquarters AFMC/PK (Contracting Directorate).

[3] A review of best supply management practices can be found in Nancy Y. Moore, Laura H. Baldwin, Frank Camm, and Cynthia R. Cook, *Implementing Best Purchasing and Supply Management Practices: Lessons from Innovative Commercial Firms*, Santa Monica, Calif.: RAND Corporation, DB-334-AF, 2002.

management. As the Air Force implements these principles, a first step in understanding how depots manage the use of contractors (as a precursor to making suggestions about how to improve surge operations) is trying to understand who these contractors are and where the work is being done. The following example shows how the right data can help accomplish this.

The Department of Defense Individual Contracting Action Report form, also known as the DD350, contains descriptive information about purchases such as the purchasing organization, the primary type of goods or services purchased, the dollar amount, the selected contractor, and the contract pricing structure.[4] We used FY 2002 DD350 data to gain insight into where contracted-out repair work was being performed and to look for patterns in repair execution.

The maps in the next three figures (Figures 4.1, 4.2, and 4.3) show the locations where work is performed by contractors for all three depots. Each circle on a map represents a zip code where contracted work is done. The size of the circle is based on the number of contracts for which work is conducted at that location.[5]

The maps show that work performed by contractors for each depot is widely dispersed geographically and, furthermore, that the work locations for contracts issued by each of the three depots are broadly similar. While each depot has clusters of contracts concentrated nearby, work for all depots is done on both coasts and in many locations in between. Hence, geographic proximity to the depots does not appear to be a factor when the depots choose their subcontractors.

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[4] A DD350 form is completed for each DoD contract transaction involving over $25,000 and contains the contract number under which the transaction was performed and descriptive information about the purchase. Several transactions can be made on a contract over the course of a year, so one contract could have many DD350 entries. The data points in these maps represent contracts, and not actions, so if a contract in Fort Worth, Texas, had 20 transactions over $25,000 in FY 2002, it would still be recorded as only one contract.

[5] Limitations of the software somewhat reduce clarity of the map images. For example, a larger circle may overlay and obscure a smaller circle. Hence, these maps should be viewed only as providing suggestive insights.

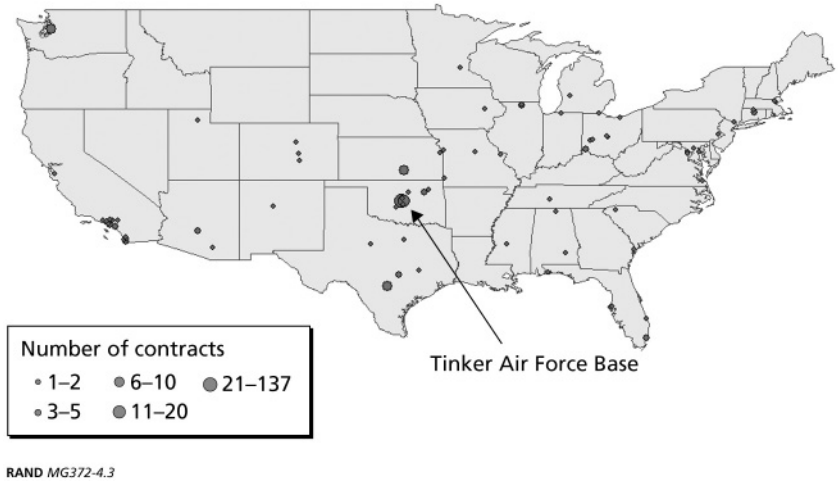
Figure 4.1
Contract Work Performed for Warner Robins

RAND *MG372-4.1*

Figure 4.2
Contract Work Performed for Ogden

RAND *MG372-4.2*

Figure 4.3
Contract Work Performed for Oklahoma City



RAND *MG372-4.3*

The dispersed geographical locations of work performed for depot contracts may indicate that "just-in-time"-type production is not an issue—at least as far as location of suppliers contributes to it. For the most part, suppliers are not located immediately next to the depots they support. The presence of small clusters that are actually near depots may indicate that location is in fact important for certain types of services. But it is possible that services done at locations far from the depots may provide rapid delivery that compensates for the geographical separation. It should also be noted that the depots may not have nearby alternatives from which to choose or that for political reasons they choose to spread their own contracting dollars to as wide a geographic dispersion as possible.

Distance from suppliers may also affect how tightly linked the depot customers can be with their suppliers. Currently, commercial best practices are thought to include the development of closer, long-term relationships with suppliers to manage business that benefits both the supplier and the buyer. For the types of services and goods that depots purchase, it might be worthwhile to determine how

important the relationship with a supplier is. If a good relationship is important, the effect that distance might have on the relationship must be considered—as well as how negative effects of distance might be mitigated through the integration of information technology.

The dispersion of work shown in the maps is very similar—if one were simply to look at a map, it would not be obvious which depot the data represented. The similarities raise the questions of whether certain types of PSCM efforts might improve the efficiency of the overall operations and whether three distinct management teams are necessary.

The purpose of these maps is not to show that all the depots manage contracts in the same way—indeed, because the depots focus on different types of repairs (landing gear, avionics, engines) and have major differences in supply chain portfolios, this would not be expected. The maps merely show that, however they are managed, all depots have contracts that are widely (and similarly) dispersed throughout the country. Further analysis of these distributions could lead to insights into whether there would be benefits to changing how the contracts are distributed.

Total current contracting costs could be used as a benchmark against which to compare in-house activities. This benchmark would be beneficial in exploring whether each depot's approach to contracting fits with the Air Force goals of enterprise-wide efforts to leverage overall Air Force purchases, centralized sourcing to better enable this leverage, and collaborative relationships with contractors to gain cost, quality, and delivery improvements. Data systems that provide more insight into how the depots operate and manage surge could allow for more explicit comparisons among different sources of repair. Increased efficiency could result from the ability to move work among the depots, depending on the availability of organic workforce and facilities, or to contractors, as appropriate.

Unfortunately, this list of possible uses for data systems makes the lack of available data more disappointing. Our search for data that would reveal more about Air Force experiences with surge had

only limited success. Even the richest data sources for SOR and SOS data have problems. We were told that so-called 1397 data[6] for SOR are perhaps 20 to 40 percent (or more) invalid for years earlier than the last four or so. (Part of the problem is that the data do not have a clear group of users, so errors have been tolerated.) It is also difficult and time-consuming to gather and analyze historical data on what was repaired, how many items were repaired, and how much time was spent repairing them during formal surge periods.

In our interviews, we asked why the data systems are not more useful to address this type of question, and we tried to assess the level of local support for this type of tool. The program managers at the ALCs described their data systems, which were developed locally. The systems were characterized by different levels of ease of use for collecting and analyzing both current and historical data, but in no case could simple queries be answered without considerable work.

The people we talked with did seem very interested in data tools that would make tracking and analysis easier. They were also supportive of the idea of a common data system that could be used at all three depots. In fact, we were told that there have been discussions in the past at the Headquarters level about the possibility of standardizing data systems, but that the resources for the development of such a system were not provided, and there have been no further efforts to move in that direction.[7] Standardizing data systems is the first step toward developing effective metrics that could help depots understand past performance and improve future performance. Such metrics would not only allow individual ALC managers to adjust local

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[6] According to the DoD Financial Management Regulation (DOD 7000.14-R), the AP-MP(A)1397 Depot Maintenance Cost System report serves as a principal database for the Assistant Deputy Under Secretary of Defense for Maintenance Policy Programs and Resources (ADUSD[MPP&R]). It is used for weapon systems depot maintenance cost and production analyses and external reporting. It is also the principal joint service database on depot maintenance production operations.

[7] The Depot Maintenance Accounting and Production System, a tool designed to improve financial management throughout DoD, may offer more insight into depot operations if successfully applied. However, one of our reviewers noted that differences in size and local conditions in each service and agency have frustrated earlier attempts to develop standardized data systems.

planning based on performance measures but would also help the Air Force to better monitor overall depot performance.

CHAPTER FIVE

Rethinking Surge

Our sponsor asked us to take a broad look at how surge activities are being managed and to use our knowledge of organizational best practices to help develop ideas for improving surge processes. We have seen evidence that the nature of surge has changed, that contractors are not well integrated into the surge planning process, and that while depot organization has changed over time, surge planning has not been significantly changed. Given what we know about the operating environment, we used this broad look to locate opportunities for innovative approaches to surge planning. While we address the question of surge specifically, some of our recommendations also have implications for overall depot management. We consider depot management and surge management in the next section. However, we note again that transitioning from peace to contingency is a matter of degree. Current initiatives propose managing with a single system because the same management practices and structures would apply to all situations.

One broad conclusion to be drawn from the limited data available on surge activities is that surge planning should move beyond the idea that there is a Cold War–style threat that would require a transition to multi-shift workloads at the ALCs. This has not yet been formally recognized and made explicit in DMRT activities.[1] The Air Force has been functioning at a high operations tempo since the 1991

[1] In fact, the depot plan 70s mention the possibility of 24-hour-a-day, 7-day-a-week operations. For example, see *Hill AFB Depot Maintenance Surge Contingency Plan 70*, draft, June 1, 2003, p. 3.

Gulf War, and depot repairs are better viewed as being at a constant high level with minor variations requiring some further overtime rather than as "one shift" operations that would experience a huge increase in the event of major war. As we heard from personnel at one ALC, "surge has become an extension of normal business." While depots have adjusted to this extension of normal business, the Air Force should make an effort to structure its formal planning process for this new state of affairs. With a generally stable workload, longer-term centralized planning should be easier, and weapon system acquisition should incorporate sustainment and surge issues.

Surge Planning

While all the ALCs have been using EXPRESS to help identify, prioritize, and distribute items requiring repair, each ALC has also developed its own planning tools independently. To take advantage of local expertise and to increase centralization of the surge process, we recommend that the Air Force explore ways to use the "best of the best" ideas from the depots. This would involve using Headquarters AFMC funding for a new initiative to develop Oplan 70s with inputs from all depots. This would take advantage of the DMRT adoption of the Advanced Planning and Scheduling (APS) system or other planning and scheduling tools. Indeed, the DMRT efforts are right in the mainstream of this approach. All the depots indicated that the use of analytic models that could look out farther in advance than current systems and estimate changes needed from changing contingency scenarios would greatly improve surge planning.[2]

There was certainly support for this centralization at the depots. At one site in particular, the managers we spoke with felt that there was the potential for improvements resulting from such an initiative. Each depot understood that the systems in use at the other depots

[2] The June 1, 2003, draft of Hill Air Force Base's Oplan 70 indicates that to establish a "pre-surge" baseline of requirements, planners use EXPRESS to make an initial forecast 90 days into the future, or a time "as determined by war planners."

had different advantages and disadvantages and that a single tool could incorporate the advantages of all three. However, they did not feel that there was Headquarters support for this—or for the resources that would be required.

Given that EXPRESS was considered a success at all three depots, we expect that further centralization of data systems could be successfully adopted and used by the depot system. The new draft Oplan 70 developed by Oklahoma City proposes this and other initiatives.

Regarding planning tools that look farther ahead, depots could use such tools to conduct experiments to learn more about how their systems would react during emergencies and then tweak the systems to improve response. Metrics will become increasingly important and should be consistent across the ALCs. One of the major Spares Campaign initiatives taken over by DMRT is the prototype APS system. This initiative could very well provide a good start on depot coordination. However, such activities would need to be based on the Planning, Programming, and Budgeting System, the resource allocation process within DoD, because one must be able to do fiscally constrained planning and also react to changed plans or circumstances.

At least one of the depots has started making some efforts in this direction. Ogden's June 2003 draft Surge Plan 70 offers a good example of implementing this kind of approach, as shown in the following extract:[3]

> a. Planning includes the following:
>
> 1. Since EXPRESS is explicitly used for surge implementation, the EXPRESS PLANNING module (EPM) will be used for surge planning at this ALC. For non-EXPRESS stock numbers, we will emulate the same process.
>
> 2. In order to establish a pre-surge baseline, EPM will run using the current flying hour scenario to establish pre-surge or "nor-

[3] From Annex D to *Hill AFB Depot Maintenance Surge Contingency Plan 70* (2003), paragraph 5a.

> mal" forecast requirements. The initial length of the forecast will be 90 days or as determined by war planners.
>
> 3. Once baseline requirements have been established, an EMP surge run will be made using wartime flying hour scenario as prepared by EMSS [EXPRESS MAJCOM Scenario Subsystem] personnel at headquarters. Baseline data will be compared to surge data and changes (increases or decreases) in all resource (carcasses, spare parts, shop capacity and funds) will be examined.
>
> b. Planning assumptions:
>
> 1. There will be sufficient funds available to achieve national security objectives during any contingency. However, in the case of an actual contingency specific authorization to exceed peacetime funding levels may be necessary.
>
> 2. Support is required to meet two concurrent but sequentially developing Major Theater War Scenarios (MTWS) using WMP-5 planning factors.
>
> 3. The surge requirements will be defined as existing Mission Capable, JCS coded non-MICAPS and Readiness Spares Package (RSP) holes for tasked units in the EMSS flying hour scenario. For production capability assessment, production shops should consider the existing surge requirements (MICAP plus RSP holes) plus increased demands generated by EPM.

Integrating Contractors

As described in Chapter Two, discussions in the Congressional Record indicate that contractors have been continually viewed as unreliable and as risky sources of work during contingencies and even during peacetime. In part because of this negative view, contractors are not well integrated into the government planning process for surge operations, despite the fact that depots have been directed to write contracts to take surge needs into account. But the industrial capacity of contractors in the United States far exceeds that of the relatively small number of government depots, and it is our contention that these contractors should be viewed as a surge planning resource in times of peace and as a surge execution resource during

contingencies. In particular, the experiences of commercial providers can help the depots benchmark and reengineer their processes as well as direct their future investments into where they will provide the most value. Within the limitations of U.S.C. Title 10, contractors should be embedded in the planning process, for both long-term planning and surge planning. This analysis is not unique to surge situations. Rather, the new approach can be incorporated into the planning for typical operations driven by regular requirements. This shift will require support from the Air Force leadership hierarchy for the depots to move forward on this initiative.

The Air Force does have access to management tools to help it improve its surge strategy. For example, a detailed spend analysis conducted with existing DD350 data may reveal opportunities to consolidate purchases and determine which suppliers are most important for depot operations.[4]

The depots, to a greater or lesser extent, have recognized the resource that contractor support represents. This recognition has taken multiple forms. For example, Ogden's Oplan 70 includes elements of contractor integration in the surge planning process. While the local depots are not specifically required to describe how they will integrate contractors in surge, the direction in the Headquarters AFMC Oplan 70 recognizes that surge operations may be required at both organic and contractor facilities to meet critical contingency needs: "Particular care should be taken in writing contracts for mission critical workloads to allow for responsive surge production by contractor sources."[5]

Another way depots can integrate contractors into surge execution is through the use of depot-operated contractor augmentee teams, or DO-CATs. These teams consist of workers provided by

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[4] RAND has conducted an initial spend analysis for the Air Force. For details, see Nancy Y. Moore, Cynthia Cook, Clifford Grammich, and Charles Lindenblatt, *Using a Spend Analysis to Help Identify Prospective Air Force Purchasing and Supply Management Initiatives: Summary of Selected Findings*, Santa Monica, Calif.: RAND Corporation, DB-434-AF, 2004.

[5] *Hill AFB Depot Maintenance Surge Contingency Plan 70* (2003), p. 16.

contractors who work alongside depot employees on specific tasks and can be used as a resource during surge production.

DO-CATs allow contractors to better understand government processes and the government to better understand how contractors can offer support during surge. This is exactly the innovative type of integration with contractors that can help improve the Air Force's flexibility for surge planning and execution.

Knowledge Management

Depots need to be able to "rationalize" their repair processes, that is, determine what should be repaired and when in accordance with *overall* Air Force needs. This is a matter less of obtaining more data than of using the data more effectively. Currently, there is no methodology for aggregating local data to create knowledge that can be used to augment policy development and implementation. The system as a whole would benefit from a closed loop where what happens locally feeds into central management that can then work to set local priorities in response to systemwide requirements. Experiments and early experience with centralized EXPRESS have shown promise in this direction. We suggest a system that can incorporate information about how production is organized and managed, including information on capacities and abilities of both facilities and human capital, and how contractors are linked into this process.

We have already seen that while AFMC writes surge guidance in an overarching Oplan 70, each depot creates its own particular Oplan 70 to meet more specific needs of local operations. A centralized authority could coordinate the Oplan 70 development process to ensure that Air Force–wide work with contractors takes advantage of efficiencies from coordination, but it could still allow decentralized execution to enable managers to meet local needs.

The Air Force has begun to understand the potential benefits of a centralized view of its work with contractors. One manifestation of this understanding is the concept of commodity councils, which manage classes of commodities across multiple weapon systems or

weapon system components. For example, a pilot commodity council has been established at Oklahoma City to coordinate the purchase of bearings for engines.

By consolidating the purchase of commodities across organizations, the Air Force not only can use its purchasing leverage to obtain lower prices but can develop an industrial policy to ensure sources of supply over the long term. A detailed spend analysis, with which organizations determine what is bought, who buys it, from whom it is bought, and how much is spent, is an important tool for determining what efficiencies might be gained from "rationalizing" the contractor supply base—that is, determining how many suppliers are really necessary to ensure the availability of services and goods at low cost. However, some of the tools for gaining efficiencies may be difficult to apply within a government context, where there are strict rules on competition along with socioeconomic goals that partially shape contracting policy. The analysis should still be done and the benefits captured where possible.

Processes and functions at each depot must also be examined to determine what can be centralized and what should remain decentralized to improve the efficiency of operations. It was clear in our interviews that the ALCs have unique administrative and work cultures. Some aspects of these cultures could help centralization, and some could hinder it. Development of a new approach must take these differences into account.

Changing the Financial Structure and "Closing the Loop"

The Air Force Depot Maintenance Master Plan was written to "reflect the essential requirement for the Air Force to maintain a ready and controlled source of organic technical competence to ensure an effective and timely response to national defense contingencies and emergency requirements."[6] It explicitly considers future

[6] U.S. Air Force, *The United States Air Force Depot Maintenance Master Plan Fiscal Years 2004–2020*, August 2002, p. MP-1.

challenges and appropriate responses by air logistics centers. According to the plan:

> Another WCF [working capital fund] issue under discussion is the cost to surge. The government must necessarily keep additional depot maintenance capacity available to surge during wartime or to accommodate technical surprises. Surge costs are now captured as part of WCF costs. The Air Force is in the process of identifying surge costs and determining if these costs should be held outside of the WCF. There are opportunities to improve Air Force cost management systems through selectively implementing Activity Based Costing, and implementing the new Air Force systems Depot Maintenance Accounting and Production System and Defense Industrial Fund Management System. These decisions are to be finalized in time for the next iteration of the Depot Maintenance Master Plan.[7]

This issue is being addressed by the current DMRT effort to refine the financial system to make it easier to relate outputs to inputs. The technical part of this is commonly referred to as activity-based costing, but in truth this is nothing more than an analytical structure that can relate resources and their costs to the outputs they produce.

Any changes in depot management must be connected to the Air Force's mission. The depot management changes must be formulated to improve the provision of necessary tools to the warfighter. This means that any measures of performance should not just answer the question of what is being repaired but also whether the weapon systems (or the parts that support the weapon systems) that airmen need most are being quickly repaired and delivered to them. The depot organizations need to be structured with this goal in mind. Furthermore, tracking tools can be developed to close the feedback loop of whether or not this is being accomplished so that trouble spots in the process can be pinpointed and fixed. If the organization does truly improve, then lessons can be shared with other DoD orga-

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[7] U.S. Air Force (2002), p. MP-13.

nizations. In many ways this was the premise of the Spares Campaign and the later DMRT initiatives. The end result is a single system that performs well in peace, boiling peace, contingency, or larger war.

CHAPTER SIX

Next Steps for the Air Force

Despite the lack of explicit focus on surge planning, the organization and management of depots have changed significantly over the past decade as a result of the implementation of such features as lean logistics and two-level maintenance policies, where warranted. In particular, the use of modern methods of allocating priorities to repair items in EXPRESS, begun in the late 1990s, has made for a tighter coupling of contingency needs and depot repair actions. Furthermore, surge is currently part of and managed more or less as "business as usual." This argues for recognition of surge planning as just one element of the complex sets of plans and procedures to provide support to the Air Force spare parts activity on an ongoing basis, rather than a special event occurring only during major contingencies.

Our analysis of the congressional debate over surge, core maintenance capabilities, and the split between contractor and organic sources did not reveal any fundamental principles that would lead to the exact definitions of core and surge. However, in our research, we examined the current environment for surge and developed some recommendations as to how the Air Force could usefully move forward.

In our view, further rationalization of planning is key. That is, the overarching goal should be the effective knowledge management of the system, including such elements as contractor and shop capabilities, benchmarking, repair shop activities, and so forth. Improved data systems are necessary for this, but not sufficient. The data systems should be designed to be useful for planning but also for the development of metrics, which can help depots understand past per-

formance and improve future performance. The system should feature "closed loop" processes, in which local outputs affect management planning, which in turn affect operations at the local level. (This kind of feedback can drive improvements very effectively.) All initiatives in this and other depot areas need much improved data so that the most effective choices can be made.

Furthermore, contractors represent a source of industrial capability that is currently underutilized by the Air Force. The purchasing and supply chain management approach of the DMRT integrates contractors into the planning process. The Air Force should make surge an explicit element of the PSCM initiative as a way of incorporating contractors into the process and use the commodity councils to benchmark commercial practices with depot practices and thus provide a basis for choosing source of repair.

Air Force leadership has the opportunity to improve its performance and better serve the warfighter by incorporating these elements into the Depot Maintenance Master Plan. Such current initiatives as the Spares Campaign and DMRT support the view of a single system used to manage both normal and surge operations and thus should be supported. Surge planning should become a part of the DMRT's charter.

How can the Air Force usefully incorporate our findings in its policies as it moves into the future? We suggest a practical approach to change aimed at the development of knowledge that could be used to better plan and manage the repair process, both of which could be refined in such a way to allow for the increased use of contractors during surge operations. We think that current legislation would not pose legal limits for such an approach.

One focus should be on better knowledge management for planning and operations. While conducting this research, we were struck by the difficulty in collecting and consolidating data that could be used to identify the surge activity levels at the depots. We were not able to identify a formal process by which operations at the most local level fed into common planning or policy development, which in turn could shape local activities. Each depot had its own data system, which could be easily tapped, more or less, for specifics about surge

levels. Our first recommendation is thus for the Air Force to engage in an exercise to consider how knowledge management might be improved. Leadership should consider what data they could use to better manage surge and then design data systems around those requirements. Ideally, leadership should be able to gain insight into how production is organized and managed, including information on capacities and abilities of both facilities and human capital, and into how contractors are linked into this process. They should consider what metrics would be most useful and design the data systems to accurately and quickly collect the data that would support those metrics. This would require a centralized discussion engaging all three depots, Headquarters AFMC, and SAF/IE.

A second recommendation is to develop centralized guidance on how to manage contractors as a potential surge asset. We have found no reason why contractors cannot be used in this way, and we have learned of local examples where they have been efficiently used for surge. But there is no clear policy on how to incorporate contractors, and the depots each take a different approach, from trying to avoid their use to seeing contractors as a source of flexibility for surge. The push for this needs to come from Headquarters, at a level above the depots themselves. Lessons learned should be shared. Other issues that could usefully be addressed in more detail are the costs and benefits of using contractors for surge. They could offer a useful source of benchmarking information as well as provide a surge resource. The existing contractor-based logistics approach to mission essential exchangeable items for the C-17 might provide useful information.

Any centralization must take into account the different cultures at the depots. They may be slower or faster to adopt changes, and may require more or less training. Incorporating the perspectives of the three depots during the process of planning for change will improve the likelihood that the end result will be a usable plan.

It may be necessary to work with Congress as a good-faith gesture to show that incorporating contractors in the surge process is not intended to do an end run around legal requirements under the 50/50 rule that 50 percent of the work be conducted in-house. Rather, contractors offer a source of surge flexibility. Certainly, jobs

as well as national security are a concern for the depot caucus, but the careful management of suppliers should not mean that government jobs are lost.

APPENDIX

Legislation Regarding "Core" Logistics Functions

Legislative History of "Core" Logistics Functions[1]

Establishing the appropriate mix of organic and private-sector performance of depot-level maintenance and repair has been a point of contention between Congress and the Department of Defense (DoD) for a number of years. At the heart of the debate is the lack of a clear definition of "core" logistics functions or activities necessary to ensure that critical skills are maintained organically in order to surge in emergency situations.

After repeated congressional requests for a clear definition of the core requirements to be performed by public depots produced less than satisfactory results, an informal 60/40 arrangement was established, in which 60 percent was set as the minimum amount of maintenance and repair to be accomplished by government facilities with the remaining 40 percent to be offered for competition. Lack of adherence to the informal congressional guidelines led to the establishment of a formal 60/40 requirement. Subsequently, the public-private mix was amended to 50/50.

Other issues related to the core logistics debate include the degree to which private industry should be involved in depot-level maintenance, how depot-level maintenance workload competitions should be handled, and how to address the considerable overcapacity in existing depots.

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[1] An initial draft of this section was prepared by Michelle Anandappa.

The following section gives some insights into the congressional intent in establishing the public-private depot-level maintenance workload mix. Drawn from committee reports, it highlights some of the key issues under consideration and debate by the various sessions of Congress. It is not intended to be a comprehensive legislative history.

Congressional Request for "Core" Clarification

It is the government policy to "outsource" functions that can be more appropriately performed by the commercial sector and to retain only those functions that are "inherently governmental." Because the governing document for determining whether outsourcing is warranted is OMB Circular A-76, the process is therefore called an "A-76 action."[2] For a variety of reasons, outsourcing work done at service depots has been an interest of Congress.

A percentage limitation on the performance of depot-level maintenance of materiel appeared in DoD guidance in 1982.[3] Services were directed to plan for no more than 70 percent of depot maintenance to be conducted in service depots. At least 30 percent of the gross workload requirements were to be decided on the basis of economy and timely availability of commercial sources and to maintain the private-sector industrial base.[4]

Congress knew of efforts by individual services to define "core" functions; the Navy Material Command was engaged in a study to identify core logistics functions at shipyards, air rework facilities, and ordnance depots, and similar efforts were under way by the Army and the Air Force. Congress wanted DoD to accelerate these studies,

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[2] Circular A-76 lays out the intent to keep in-house all functions that are inherently governmental, and to outsource those that could more appropriately be performed by contractors in the commercial sector.

[3] DoD Directive 4151.1, Use of Contractor and DOD Resources for Maintenance of Material, July 1982.

[4] 131 Cong. Rec. H4853, Department of Defense Authorization Act, 1986, June 25, 1985.

refine them, and provide a list of jobs exempted under core logistics criteria.

In 1985, core logistics functions or activities were exempted from being contracted out. To determine the exempt activities, the Secretary of Defense was required to submit a report to the House and Senate Armed Services Committees identifying specific core logistics functions or activities necessary "to ensure effective and timely response to a mobilization, national defense contingency situations, and other emergency requirements."[5] Those functions and activities identified could not be contracted out unless the Secretary had determined that government performance of the activity was no longer required for national defense reasons.

The first DoD response in accordance with this requirement was a letter submitted by Deputy Secretary of Defense William Taft IV.[6] This letter took a broad view of "core" logistics activities, describing them more as a management philosophy—that is, as the maintenance of logistics capability through the use of prudent levels of government-owned and government-operated, government-owned and contractor-operated, contractor-owned and contractor-operated facilities, or a combination of the three. The allocation of the workload was to be made on a case-by-case basis, taking into consideration, first, the need for both government and commercial industrial bases and, second, the relative cost-effectiveness. Secretary Taft stated in the letter that the core logistics capability at the depots comprised facilities, equipment, and management personnel. The work could be performed by either government or contractor personnel. The letter concluded with a listing of the relevant government depots, arsenals, and shipyards.

Congress felt that Taft's letter was inconsistent with the law. In a letter to Secretary of Defense Caspar Weinberger, Representative Bill Nichols wrote, "According to the report, core logistics at the listed depots, shipyards, and arsenals only relates the real estate,

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[5] 131 Cong. Rec. H4853.

[6] Letter by William H. Taft IV, dated March 29, 1985 (found in 131 Cong. Rec. H4853).

physical plant, equipment and management personnel. The rest of the workforce will be subject to A-76 review and contracting out."[7] Because Congress was really interested in obtaining a list of jobs that should not be subject to A-76 actions, the law was clarified.[8]

Secretary Weinberger's response to Nichols' letter[9] showed that DoD was not convinced that an enumeration of jobs that could not be contracted out was good policy. He noted that the department's decision on core logistics was not made lightly and was not in any manner an effort to circumvent the intent of Congress. In his opinion, DoD must be allowed maximum flexibility in the allocation of resources and to "fence off a significant segment of those resources from management review would not serve to enhance readiness but would detract from it." As well, the department relies on private contractors for support in various capacities, including building weapon systems and equipment, operating government-managed depots, etc., and they have served in past conflicts and therefore can be relied upon in the future. Weinberger concluded his letter to Nichols by asking for congressional support for the flexibility needed to obtain the best national defense for the dollar.

The 60/40 Depot-Level Maintenance Allocation

An Armed Services Committee Report in the 102nd Congress[10] expressed concern that some depots were forced to compete up to 80 percent of their maintenance and report workload, jeopardizing core capabilities. Drawbacks cited by the committee to this circumstance included the high cost incurred by the government in preparing bid proposals, the loss of critical skills within the services' maintenance

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[7] Letter by Bill Nichols, dated May 14, 1985 (found in 131 Cong. Rec. H4853).

[8] Amendment to H.R. 1872 offered by Mr. Nichols of Alabama, Section 308, Specification of Core-Logistics Functions Subject to Contracting-Out Limitation, found in 131 Cong. Rec. H 4853.

[9] Letter by Caspar W. Weinberger dated May 24, 1985 (found in 131 Cong. Rec. H 4853).

[10] 102 H. Rpt. 60, May 13, 1991.

and repair (M&R) depots, the inability to surge in critical situations as a result of the loss of specific capabilities, and the prospect that some companies may "buy in" to contracts and then increase prices once depots have lost a specific skill base.

Since DoD had failed to define a formal core level necessary to maintain the critical skills to support the warfighting requirements of the department, the committee recommended an informal arrangement; the basic level of 60 percent was set as the minimum level of M&R workload to be accomplished by government facilities, and the remaining 40 percent could be offered for competition. The committee strongly urged that the department not change the core 60/40 concept unless a core definition was agreed upon. Public Law 102-190[11] set 60 percent as the minimum amount of depot-level maintenance of materiel in the Army and the Air Force to be performed by employees of DoD. This percentage limitation was to be measured in funds available for each fiscal year for depot-level maintenance of materiel.

Further attempts were made to establish a definition of "core" by the Committee on Armed Services.[12] The intent of core under the informal 60/40 arrangement between the department and the committee was to ensure that critical skills were preserved in every major area of depot-level maintenance and repair. In reality, depot-level workloads were averaged within or between the services to achieve the 60 percent core level. According to the committee, the guidelines of the informal arrangement were not followed closely by each of the services, raising concerns that critical skills within the services' M&R depots may be lost and therefore adversely affecting the ability to surge in critical situations.

The committee was particularly concerned by the Army's inability to achieve the goal of having a minimum of 60 percent of depot level aviation M&R conducted by government employees. The

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[11] Public Law 102-190, Div A, Title III, Part B, Section 314(a)(1), 105 Stat. 1336, December 5, 1991.

[12] 102 H. Rpt. 527, National Defense Authorization Act for Fiscal Year 1993, May 19, 1992.

committee recommended a legislative provision to suspend current department practice and clarify the committee's intent.

To avoid further confusion regarding the meaning of core, the committee established a formal definition of the basic level of M&R that must be conducted in-house, where a "minimum of 60 percent of depot-level maintenance and repair with respect to each type of material or equipment, for each military service, must be conducted by government employees."[13] The 60 percent minimum was considered a floor, not a ceiling, and as a requirement, not a goal. Core requirements for each individual category, including ships, aircraft, ordnance, supply, and land forces within each services, had to be met before any item from that individual category could be considered for competition.

The committee expressed its disapproval of using competition to shift workload from the public sector to the private sector. Therefore, the committee required each service to offer at least the same amount of contracts in each category for competition from the private sector as it offers for the public sector. Furthermore, the committee insisted that items offered for competition not be drawn disproportionately from any one depot. Finally, the committee indicated concern about outsourcing components of a total system to private contractors, which may cause depots to lose the expertise and capability to do totally integrated systems repair. The committee directed the Secretary of Defense to correct these practices to ensure the needed capabilities are retained.

The Committee on Appropriations[14] raised the issue of proposals within DoD to "privatize" depot maintenance workloads carried out by government facilities. The committee stated that such action would represent a significant policy change requiring a formal legislative request and approval by Congress. Furthermore, the committee believed that statutory provisions and initiatives already strike a reasonable balance and that such an action would dramatically affect

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[13] 102 H. Rpt. 527.

[14] 102 H. Rpt. 627, Department of Defense Appropriation Bill, 1993, June 29, 1992.

existing policy regarding core. The issue was once again raised in the 1994 Defense Appropriation Bill,[15] with the committee asserting the need for DoD to develop a uniform policy concerning the public-private mix and restating that changes to the existing policy should not occur unilaterally but only through congressional approval.

Moreover, in the 103rd Congress, 2469 of U.S.C. Title 10 was clarified to indicate that a depot-level maintenance workload that has a value of $3 million or more and that is being performed in-house may not be performed by a private contractor unless the Secretary uses competitive procedures prior to the selection of the private contractor.[16]

Defense Depot Task Force Recommendations and Congressional Reaction

A central theme of the hearings held by the Committee of Armed Services in the 103rd Congress on how depot-level maintenance should be conducted in the future was "that the reductions in the defense budget proposed over the next five years could alter the structural relationships that private and public sectors have traditionally had in the defense base."[17] A January 1993 report by the Joint Chiefs of Staff (JCS) found that DoD had 25 to 50 percent more capacity than needed. The study recommended that a joint command be established to implement a consolidation plan and manage the ensuing depot system. The committee found problems with the JCS study, citing that commanders from every service's materiel command testified that they would prefer other alternatives to the JCS

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[15] 103 H. Rpt. 254, Department of Defense Appropriations Bill, 1994, September 22, 1993.

[16] 103 S. Rpt. 112, Authorizing Appropriations for Fiscal Year 1994 for Military Activities of the Department of Defense, for Military Construction, and for Defense Activities of the Department of Energy, to Prescribe Personnel Strengths for Such Fiscal Year for the Armed Forces, and for Other Purposes, July 27, 1993.

[17] 103 H. Rpt. 200, National Defense Authorization Act for Fiscal Year 1994, July 30, 1993.

study and that the study looked at the government depots in isolation without taking into account maintenance capacity or capability of the private sector.

The committee found that

> in order to determine which work is inherently organic and which work is to be contracted, more input is needed from the private sector, and more guidance is needed from the Department of Defense and its ongoing strategic review, which includes the depot consolidation and realignment. The department needs to identify key weapon systems, key industrial sectors, optimum core depot workload capability and the proper level of capital investment in government facilities.[18]

The committee recommended the establishment of the Defense Depot Task Force in order to understand these various issues. The Secretary of Defense was directed to carry out the analysis and report its findings to the committee. The task force recommendations[19] and the committee's opinion of the recommendations were as follows:

- Change the requirement in current law that 60 percent of depot maintenance be performed by government depots. Testimony by DoD officials indicated that the public-sector share of depot maintenance workload increased from 67 percent in 1990 to 71 percent in 1993. The committee noted General Accounting Office (GAO)[20] testimony that stated that these statistics do not accurately portray funding going to the private sector and that at least half of the depot maintenance funding currently goes to the private sector when the cost of raw materials and parts purchased from the private sector by public depots is included.

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[18] 103 H. Rpt. 200.

[19] 103 H. Rpt. 499, National Defense Authorization Act for Fiscal Year 1995, May 10, 1994.

[20] On July 7, 2004, the GAO's name was changed to the Government Accountability Office.

- Endorse the current DoD definition of core depot capability that must be retained in-house, which states, "Depot maintenance core is the capability maintained within organic Defense depots to meet readiness and sustainability requirements of the weapons systems that support the JCS contingency scenario(s)." The committee believed that this core definition was neither quantifiable nor qualitative, thus limiting the ability of Congress to assess whether the department is abiding by its rules.
- Eliminate public-private competition in favor of a policy that would transfer workload above core to private industry without having to compete. The committee noted GAO testimony stating that the transfer of non-core workload to the private sector could conflict with the long-standing policy of awarding work to the most cost-effective provider and that there would be no incentive for industry to reduce costs.
- The report stated that depot core requirements are along strict service lines as codified by U.S.C. Title 10. The committee noted GAO testimony stating that Title 10 does not require the retention of workload in a service-specific depot and that a DoD-wide core definition may encourage increased consolidation and interservice work.

In review of the task force findings, the committee continued to believe that there was still no acceptable national depot policy; the committee believed that maintaining the "capability" to perform workload may not be sufficient to sustain the minimum amount of workload that would provide for an adequate military industrial base.

Private-Sector Involvement, Excess Capacity, and Interservicing

Other issues raised by the Committee on Appropriations[21] in the 103rd Congress included the degree to which private industry should

[21] 103 H. Rpt. 254, Department of Defense Appropriation Bill, 1994, September 22, 1993.

be involved in depot-level maintenance, the considerable overcapacity in existing depots, and the failure of DoD to streamline depot operations through "interservicing," that is, having one service perform depot maintenance for other services, eliminating duplicative activities.

In taking the first issue, the committee observed that private-sector share of depot maintenance was substantial, in excess of one-third. In its testimony before Congress, GAO cited concerns by DoD officials about the ability of the private sector to respond to short-notice and conflict requirements, whether private contractors could provide depot maintenance and lower cost, and the ability of maintenance contracts to sustain manufacturing skills without significantly increasing repair costs.

The committee considered the issue of overcapacity as well. The committee referred to JCS and GAO studies, which found that considerable overcapacity exists in the depot structure. The studies indicated overcapacity up to 50 percent, which if streamlined, could generate cost savings in the billions of dollars. The committee stated that the unwillingness of the services to cooperate in interservicing and the lack of oversight and strong leadership by the Office of the Secretary of Defense have led to squandered opportunities by the department to eliminate excess capacity. A subsequent committee report cited increased interservicing as the key to eliminating excess capacity.[22]

Depot-Level Maintenance Workload Competitions

In a report considering the 1995 Department of Defense Appropriations Bill,[23] the Committee on Appropriations stated that DoD had recommended the core depot maintenance capabilities be retained organically. But the department was considering directing all remaining workload to the private sector. In the absence of data sug-

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[22] 103 S. Rpt. 153, Department of Defense Appropriation Bill, 1994, October 4, 1993.

[23] 103 H. Rpt. 562, Department of Defense Appropriation Bill, 1995, June 27, 1994.

gesting this action would save money, the potential for the arbitrary application of a core definition, and without competition from depots, the committee did not support giving the private sector the workload currently performed by organic depots.

The October 1993 Committee on Appropriations report[24] indicated that in 1985, the committee directed the Navy to test competition for allocating ship overhauls between public and private shipyards. In FY 1991, the committee approved public-private competition for all other services. DoD had developed a plan to save about $1.7 million through the programs' implementation from 1991 to 1997. However, GAO found little evidence that the lessons learned during public-private competitions were being applied to noncompeted work and stated that the projected cost reductions from individual competitions were overly optimistic. The committee found this indicative of the haphazard manner in which the services' competition programs were implemented.

A Committee on Appropriations report indicated concern over the DoD's policy decision to discontinue public-private and public-public competitions.[25] The committee believed that only a competitive environment ensured efficient and economic policies and procedures. In the absence of competition, depot maintenance prices had the potential to increase dramatically. Despite this concern, the committee noted that the database, financial management, and cost comparison systems were not sufficient to ensure a level playing field and that the process by which the department bids and awards workloads was not consistent with sound business practices. The private maintenance industry had raised concerns about the fairness of competition programs, specifically the differences between public and private accounting practices that unfavorably affect private industry and the concern that the competition process inherently favors the public sector.[26]

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[24] 103 S. Rpt. 153.

[25] 103 S. Rpt. 321, Department of Defense Appropriation Bill, 1995, July 29, 1994.

[26] 103 S. Rpt. 153.

The committee directed DoD to reinstitute competition for depot maintenance workload funded in FY 1995 and thereafter and to improve the award process to enhance the quality of future competitions. It was determined that corrective actions on future legislation would be considered by the committee should the department fail to reinstitute competition.

Amendment of the 60/40 Allocation to 50/50

In a 1995 report on the National Defense Authorization Act for Fiscal Year 1996, the Committee on National Security[27] said that eliminating the 60/40 restriction in 2466 of U.S.C. Title 10 was not necessarily inconsistent with maintaining a strong depot infrastructure. The Secretary of Defense was directed to recommend a policy for the performance of depot-level work in which he would articulate, among other things, the core requirements to be performed by public depots; delineate which competencies, skills, volumes, and plant capacities are needed for the services to perform their missions; and how these requirements might be met. The report noted: "Congress previously enacted various measures to preserve the capacity to perform depot-level work, absent a viable policy within DOD. These measures have tended over time to limit flexibility to the point where restructuring in order to respond to new requirements and conditions is very difficult."[28] To enhance flexibility, the committee recommended that 10 U.S.C. 2466 along with 2469—which required a competition for the movement of an existing workload of more than $3 million from a depot—be repealed. The committee cautioned DoD that the most effective public-private mix may not be the most cost-effective and

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[27] 104 H. Rpt. 131, National Defense Authorization Act for Fiscal Year 1996, June 1, 1995.

[28] 104 S. Rpt. 112, Authorizing Appropriations for Fiscal Year 1996 for Military Activities of the Department of Defense, for Military Construction, and for Defense Activities of the Department of Energy, to Prescribe Personnel Strengths for Such Fiscal Year for the Armed Forces, and for Other Purposes, July 12, 1995.

that national security considerations must take precedence over simple cost avoidance.

Although Sections 2466 and 2469 were not repealed, the committee had laid the groundwork for the adjustments to the depot maintenance limitation provision with the enactment of Section 311 in the National Defense Authorization Act for Fiscal Year 1996 (Public Law 104-106). This provision required the department to develop a responsible, comprehensive depot maintenance policy and to report to Congress on its findings. According to the report by the Committee on National Security in 1996,[29] DoD had failed to address many of the primary requirements of the statute, specifically:

> providing for performance of core depot level maintenance and repair capabilities in facilities owned and operated by the United States; providing for core capabilities necessary to meeting the requirements of the National Military Strategy; providing for sufficient organic workload to ensure cost-efficiency and technical proficiency in time of peace; providing for competition for above core workloads between public and private entities to achieve cost savings; adequately addressing issues concerning exchange of technical data between the Federal Government and the private sector; developing a methodology that ensures that appropriate costs to the government and the private sector are identified; and providing for the performance of maintenance and repair for any new weapons systems defined as core in facilities owned and operated by the United States, and other considerations.

The committee was also disappointed that the department failed to provide Congress with the detailed methodology used to determine core requirements:

> We are especially concerned about the Departments predilection toward private sector accomplishment of core depot level maintenance without the development of an analytically based risk assessment process. We view core depot level workload as synonymous with organic workload. Core workload should be

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[29] 104 H. Rpt. 563, National Defense Authorization Act for Fiscal Year 1997, May 7, 1996.

> accomplished by government employees in facilities owned and operated by the United States with only limited exceptions. We believe that the defeat of the amendment to repeal 10 U.S.C., Section 2466 validates this view.[30]

Moreover, DoD did not offer concrete data to support its assertion of the cost savings achieved by privatization and outsourcing of depot-level maintenance. The committee noted that DoD had revealed in testimony that more than 50 percent of public-private competitions were won by the public sectors, indicating that competition rather than privatization may potentially achieve the greatest potential savings.

The Committee on National Security was unhappy not only with DoD but with the White House as well. The Clinton administration had proposed legislation that would grant DoD blanket authority to contract out "commercial and industrial type supplies and services" including but not limited to depot maintenance, "notwithstanding any provision of title 10, United States Code, or any statute authorizing appropriations for, or making appropriations for, the Department of Defense."[31] Moreover, the administration had failed to eliminate excess capacity or achieve savings through consolidation by pursuing privatization in place of facilities closed by the 1995 Base Realignment and Closure (BRAC) Commission. According to the committee, the policy put forth by the administration appeared to have been developed without proper consideration of future readiness and seemed directly aimed at circumventing both congressional intent and public law, specifically, Public Law 101-480 (BRAC) and U.S.C. Title 10, Sections 2464, 2466, 2469, and 2472. According to the committee's report, "by its actions, the Administra-

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[30] 104 H. Rpt. 563.

[31] 104 S. Rpt. 267, Authorizing Appropriations for Fiscal Year 1996 for Military Activities of the Department of Defense, for Military Construction, and for Defense Activities of the Department of Energy, to Prescribe Personnel Strengths for Such Fiscal Year for the Armed Forces, and for Other Purposes, May 13, 1996.

tion has embarked on a journey that impairs readiness and could lead to a return of the hollow force of the 1970s."[32]

The Fiscal Year 1997 National Defense Authorization Senate Armed Services Committee report[33] included a provision that would amend the 60/40 rule regarding the allocation of depot-level maintenance, changing it to 50/50. The "compromise" measure adopted by the committee required DoD "to preserve a core depot capability that could maintain the types of weapons systems that the warfighting commanders-in-chief identify as mission essential."[34,35] The then-current definition of core logistics functions would be codified and require DoD to maintain sufficient capability (not actual repair) organically to perform M&R of "mission essential" weapon systems and equipment required to support JCS contingency scenarios.

In addition, the basis for calculating public depot maintenance changed from work performed *by* federal employees to work performed *in* federal facilities, which was intended to give greater flexibility for arranging private-sector participation of maintenance workloads in organic facilities.[36] The committee also wanted to codify the definition of depot-level maintenance as prescribed by DoD Directive 4151.18 as including materiel maintenance or repair requiring the overhaul or rebuilding of parts, assemblies, or subassemblies and the testing and reclamation of equipment. The definition would apply to depot maintenance funded through interim contractor support and contractor logistics support, which, according to

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[32] 104 H. Rpt. 563.

[33] 104 S. Rpt. 267.

[34] 105 S. Rpt. 29, Authorizing Appropriations for Fiscal Year 1998 for Military Activities of the Department of Defense, for Military Construction, and for Defense Activities of the Department of Energy, to Prescribe Personnel Strengths for Such Fiscal Year for the Armed Forces, and for Other Purposes, June 17, 1997.

[35] Public Law 105-85 (November 18, 1997) changed Title 10 (Section 2466, paragraph a) to read "Not more than 50 percent of the funds made available in a fiscal year to a military department or a Defense Agency for depot-level maintenance and repair workload may be used to contract for the performance by non-Federal Government personnel of such workload for the military department or agency."

[36] 105 S. Rpt. 29.

the committee report, had not been reported as depot maintenance.[37] The definition would not apply to ship modernization activities.

The Privatization-in-Place Debate

A report by the Committee on National Security[38] noted that the Air Force depot system continued to be plagued by excess capacity. The BRAC Commission found more than 50 percent excess capacity across the system and recommended the closure of the two least efficient and lowest military value facilities, San Antonio Air Logistics Center (at Kelly Air Force Base, Texas) and Sacramento Air Logistics Center (at McClellan Air Force Base, California). The report also noted the findings of the Defense Science Board, which stated:

> The task force strongly urges DOD to avoid privatization-in-place (PIP) strategy for outsourcing DOD support functions. Under this approach, DOD transfers the organic facility, workload, and workforce to a single contractor or group of contractors. The contractor or contractors are obligated to perform that workload in the transferred facility. As a result, PIP often results in the artificial preservation of surplus capacity and the suboptimal utilization of resources.[39]

The Committee on Armed Services[40] raised concerns regarding the administration's pursuit of a PIP policy for depot maintenance workloads performed at Kelly and McClellan Air Force bases. The committee found it troubling that the Air Force refused to reduce excess depot capacity by moving the Kelly and McClellan workloads to remaining air logistics facilities. According to views stated by Senator James Inhofe, Chairman of the Readiness Subcommittee, despite

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[37] 105 S. Rpt. 29.

[38] 105 H. Rpt. 132, National Defense Authorization Act for Fiscal Year 1998, June 16, 1997.

[39] 105 H. Rpt. 132.

[40] 105 S. Rpt. 29.

DoD claims that the Air Force was planning for public-private competitions and no longer pursuing a PIP strategy, there was reliable evidence that the manner in which competitions were structured strongly favored private-sector bidders that propose to do work in-place. Senator Inhofe stated that "many features of the planned competitions appear to both favor the private sector and create strong disincentives for moving the work from their present locations. In other words, the Air Force is still pursuing privatization in place, only by another name."[41]

Senator Inhofe also raised concerns about the Air Force plan to "bundle" discrete workloads into a single package for competition. While two depots would be able to prove the most cost-effective proposal for the entire package, it would be unlikely for a single, specialized depot to be able to compete for the entire workload. Other issues raised by Inhofe included marginal pricing by the private sector, teaming and subcontracting restrictions on the public sector, differing methods of depreciating capital assets, protest procedures insufficient for public depots, and different evaluation methodology: low cost for public sector, best value for private sector.

Discussion

The preceding discussion reveals that depot management and operations have been the subject of intense congressional interest over the past years. In spite of this interest, attempts to define "core" and "surge" have not been entirely successful. Furthermore, Congress has made no final statement that all surge work must be performed organically. While the maintenance of a "core" capability is in part geared toward making sure the operating forces have the equipment they need during wartime surge periods, there is no law that the surge work must be completed in-house.

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[41] 105 S. Rpt. 29.

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Chronological List of Key Legislation Related to Core, Surge, and Depot Workload

DoD Directive 4151.1, Use of Contractor and DOD Resources for Maintenance of Material, July 1982.

FY 1984 National Defense Authorization Act, Public Law 98-525, October 19, 1984, codified in U.S.C. Title 10, Section 2464, paragraph (a)(1). [Established requirement for government "core logistics capability.]

Congressional Record, 131 Cong. Rec. H4853, May 14, 1985. [Idea of "core" related to Circular A-76 and contracting out government work.]

131 Cong. Rec. H4853, Maintenance of In-House Capability and Reliance on Private Contractors, June 25, 1985. [Letter from William H. Taft IV, Deputy Secretary of Defense, and the Honorable Les Aspin, Chairman of the House Armed Services Committee; letter from Secretary Caspar Weinberger to Representative Bill Nichols, May 24, 1985.]

131 Cong. Rec. H4853, Department of Defense Authorization Act, 1986, June 25, 1985. [No more than 70 percent of workload is to be in service depots.]

102 H. Rpt. 60, May 13, 1991. [Concern that some depots were forced to compete up to 80 percent of their maintenance and report workload.]

Public Law 102-190, Division A, Title III, Part B, Section 314(a)(1), 105 Stat. 1336, December 5, 1991. [Established 40 percent limit for contracting out.]

102 H. Rpt. 527, National Defense Authorization Act for Fiscal Year 1993, May 19, 1992. [Stated that 60 percent of depot-level maintenance and repair, with respect to each type of materiel or equipment, for each military service must be conducted by government employees.]

102 H. Rpt. 627, Department of Defense Appropriation Bill, 1993, June 29, 1992. [Established that "privatizing" depots would require congressional approval.]

103 H. Rpt. 200, National Defense Authorization Act for Fiscal Year 1994, July 30, 1993. [Noted the need to determine the capital investment required in government facilities.]

103 H. Rpt. 254, Department of Defense Appropriations Bill, 1994, September 22, 1993. [Said that DoD needed a formal policy on public-private mix.]

Public Law 105-85. (See United States Code, 1994 Edition, Supplement IV, Vol. 1, p. 1217.) [Directed Office of the Secretary of Defense to develop policy on depot-level maintenance.]

Public Law 105-85, November 18, 1997) (changed U.S.C. Title 10, Section 2466, paragraph a). [Established 50-percent limit for contracting out; core capability required in government facilities with government personnel.]